THE

GEOGRAPHICAL MAGAZINE.

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JAMES GRAHAM GOODENOUGH.

It is too painful a task to write fully of one so lately lost to us, so dearly loved as Commodore Goodenough. The blow is too recent and too heavy. Yet affection for his memory obliges us to place on record at least the bare facts of the good and useful life of one who contributed to and took so warm an interest in the success of this journal.

His family had been settled at Broughton Pogges in Oxfordshire from the end of the sixteenth century, and held the advowson of the living. Samuel Goodenough, a son of the rector of this village, became Bishop of Carlisle in 1808, and was an eminent botanist, Treasurer of the Linnæan, and a Fellow of the Royal Society. His eldest son Robert was rector of Carlton, and married Cecilia Markham, youngest daughter of the Archbishop of York. His second son Edmund was born in 1785. He took the highest university honours at Oxford in 1804, and became tutor and censor of Christ Church. His tastes and accomplishments were not confined to the classics, but extended to modern literature and the fine arts. He was Head Master of Westminster School from 1819 to 1828, and Dean of Wells from 1831 to 1845. Dean Goodenough was a Fellow of the Royal Society, one of the original Fellows of the Royal Geographical Society, and a member of its first Council. He also contributed a paper on the Black Sea to the first volume of its journal. In 1821 he married Frances, daughter of Samuel Pepys Cockerell, Esq., and the late Commodore was his second son.

James Graham Goodenough was born on the 3rd of December 1830, and at the age of 11 he went to Westminster School. He was as a boy what he continued to be as a man—honourable, true, tender-hearted, modest, brave, and a hater of all things evil. There was something in his society which raised others unconsciously. Yet he was not one of those boys who were never to be found in the fighting green or out of bounds. On the contrary, while joining heartily in all that other boys did, whether allowed or forbidden, he kept all real evil from himself and his companions by a sort of natural force. Every one liked him, and rejoiced at his successes in school and on the water, which were extraordinary for so young a boy.

On May 7th, 1844, he entered the navy as a naval cadet on board H.M.S. 'Collingwood,' a line-of-battle ship commissioned to bear the flag of Admiral Sir George Seymour on the Pacific Station. His father and mother, with his brothers and sisters, came to Bembridge while the 'Collingwood' was lying at Spithead, and their little yacht the 'Traveller' daily hovered round the great ship. When, on the 7th of September 1844, the 'Collingwood' sailed for an absence of four years, the Dean followed her far out to sea, very loth to lose sight of the new floating home of his boy. They were never to meet again in this world, for the Dean of Wells died on May 2nd, 1845, more than three years before the 'Collingwood's' return.

As a midshipman, young Goodenough fulfilled the promise he had given as a boy at Westminster. Always modest and unassuming, he naturally took the lead in everything; the best as a linguist, in navigation, in seamanship, and in all exercises, and among the foremost in all expeditions. His messmates looked to him as their leader, almost as their guide; and none of them ever ceased to look back, with regret, to those happy four years. On every emergency his first thought was for others. Once he and another lad took a long excursion among the wild ravines of Juan Fernandez. Scrambling through masses of huge leaves which concealed everything in front, Goodenough was a few paces ahead. Suddenly his companion heard a crashing sound, and, as he crept forward, Goodenough's warning voice urged him anxiously not to follow. At the moment he must have been in great agony. He had fallen down a sheer precipice, and had sprained his ankle, besides being severely crushed and bruised. It was twenty-four hours before he could be found and extricated.* His companion never forgot that warning cry, which probably saved his life, and which added a feeling of reverence to his love for such a messmate. But this was Goodenough's character. In pain or in danger his first thought was for others.

When the dear old 'Collingwood' was paid off, Goodenough joined the 'Cyclops,' under Captain Hastings, and went to the coast of Africa. On the 23rd of June, 1851, he was promoted to the rank of lieutenant for passing the best examination at the College; and from the 11th of September 1851, to the 6th of May 1854, he served as lieutenant on board the 'Centaur,' the flagship on the Brazilian station.

During the war with Russia Goodenough served under Captain Caffin in the 'Hastings,' from February to December 1855, and was gazetted as having been

* See *Four Years in the Pacific, in H.M.S. 'Collingwood,'* by the Hon. Fred. Walpole (Bentley, 1849, 2 vols.), i., p. 376.

engaged with rocket-boats at the bombardment of Sweaborg. He then obtained a brief interval of rest, after eleven years of continuous service, and went on two months' leave to join his sister at Malta. But on the 15th of February, 1856, he was again employed to command the gunboat 'Goshawk,' and he was in her at the great review after the peace, and until September 3rd. He then went out to China in the 'Raleigh,' joined the flagship 'Calcutta,' and was actively employed in the operations of the Chinese war. He was gazetted on four occasions. On the 6th of July, 1857, Sir Robert M'Clure reported that Goodenough captured a large snake-boat from pirates in the Canton River. On August 1st, 1857, he was gazetted as having been thrice in action in boats, at the destruction of Chinese war-junks. On February 26th, 1858, he was gazetted for gallant service at the assault and capture of Canton, and on the 28th of July for his services on shore at the capture of Chinese forts in the Peiho River. He had been specially promoted to the rank of Commander on the 26th of February 1858, the day of the capture of Canton.

In August 1859 he returned to England in the 'Calcutta,' and from September 1859, to November 12th, 1861, he commanded the 'Renard,' also on the China station. He then had another brief season of rest at home, a time which was very dear to one of his affectionate, loving nature. But on July 3rd, 1862, he was appointed to the 'Revenge,' in the Channel squadron, and had the pleasure of again serving with his Captain of the old 'Collingwood' days, the late Sir Robert Smart. On the 9th of May, 1863, Goodenough was promoted to the rank of captain, and was on shore for nearly eighteen months, thus again earning a brief period of refreshing rest.

It was in 1863 that Captain Goodenough became a Fellow of the Royal Geographical Society, and a member of the Geographical Club. He also became a member of the Hakluyt Society, and undertook the translation and editing of *Bethencourt's Conquest of the Canary Islands*, but subsequent employment prevented him from completing it. In August 1863 he attended the British Association at Newcastle, and took a very active part in the Geographical Section, which was particularly busy during that meeting. Then followed a union which increased very much the happiness of the last eleven years of Goodenough's life. He was married on the 30th of May, 1864, to Victoria, the daughter of William John Hamilton, Esq., and of the Hon. Margaret, daughter of the 13th Viscount Dillon. Mr. Hamilton was an ardent geographer, and received the medal of the Royal Geographical Society for his survey of Asia Minor. He was President of the Geographical Society in 1837, 1841, 1842, and 1847, and afterwards of the Geological Society. His death took place in June 1867.

Captain Goodenough's happiness was secured by his marriage, in the perfect companionship he enjoyed, and in his loving interest and solicitude for his two boys, Leonard and William. He had reaped the reward of a good and noble life, of long and true service, and we may rejoice that he was spared to enjoy it for several happy years. Yet even at this time he was usefully and actively employed in examining the American dockyards; and in August 1864 the Lords of the Admiralty expressed satisfaction at the way in which he had performed the special services entrusted to him in visiting the United States, to collect information on the subject of the ships and armaments of the Republic.

On the 2nd of November, 1864, he was appointed to the 'Victoria,' the last commissioned three-decker, to bear the flag of his old captain, Admiral Sir Robert Smart, in the Mediterranean. There he did most valuable service in watching over and training the young officers under his charge, who will, in their turn, do good and true service for their country. In 1867 he was appointed to the five-masted iron-clad 'Minotaur,' which he commanded until the 25th of October 1870.

From the 9th to the 14th of February, 1871, Captain Goodenough was employed in revictualling Paris after the Prussian siege, and he afterwards, accompanied by his wife, distributed the *Daily News* "Peasant Relief Fund." Mr. W. Bullock Hill thus writes to the *Daily News*:—"In the dreariest period of the gloomiest of Novembers, when autumnal rains were giving place to snow and sleet and frozen winter fogs, and we, whose business it was to convey food and clothing over the slippery and almost impassable roads to the destitute in the villages about Sedan, were almost in despair at the task we had undertaken, and were in sore need of encouragement, there came a man the very sight of whom at once communicated new life to us. Here was a man, the very model of an Englishman, with unbounded energy, and combining extreme gentleness with an iron sense of duty, born to command, and with a genius for communicating the love of order and regularity which characterised him—a man before whom one could only feel inclined to bow down—here was this man come to place himself meekly under orders, and to go plodding day after day through snow and slush. When the news of Commodore Goodenough's death reaches the villages about Sedan, where he laboured and made himself beloved, there will be grief as genuine as his friends and countrymen must feel for him, and grief which he himself would have valued not the least amongst the tributes to his memory."

Mr. Bullock Hill of the *Daily News* was one of Captain Goodenough's colleagues, and we sincerely thank him for this tribute to the memory of our dear friend.

From the 3rd of September, 1871, to the 9th of August, 1872, Captain Goodenough was employed by the Admiralty in visiting and reporting upon the naval dockyards and armaments of Russia, Austria, Italy, and France; and at this period also he urged upon the attention of the Admiralty the importance of naval education, at the same time submitting a feasible scheme. His able and most interesting article on the subject of "Naval Education" appeared in our number of *Ocean Highways* for February 1873, p. 345.

On the 22nd of May, 1873, he was appointed to H.M.S. 'Pearl,' as Commodore on the Australian Station. He went out with the resolution of doing valuable work, of advancing hydrography and geography, and of furthering the cause of humanity, and in this he has nobly succeeded, although we cannot reconcile ourselves to the horrible circumstances of his death.

Commodore Goodenough communicated to us a very interesting paper on Amsterdam Island during

his passage out;* and he then proceeded to the Fiji Islands. In 1874 he arrived at Levuka, and practically put an end to the so-called Constitutional Government, which had for nearly three years harassed Fiji. We have, in a previous number (March 1875, p. 85), noticed his able report on the Fiji Islands, and we have shown that the principal measures connected with the acquisition of this colony are due to him, and that they originated from his statesman-like advice. Faction may have been induced to depreciate his report, but it will long be valued and referred to as an inexhaustible store-house of information on the subject of the Fiji colony.

Nor, as we then pointed out, were his services in connection with Fiji confined to the preparation of a lucid report. He preserved order for many months, collected accurate information, and prepared the way for annexation with remarkable tact and judgment. Fiji became a British colony on October 10th, 1874; and among the names most honourably connected with the first page of its history that of Goodenough will be foremost.

For his gallantry during the Chinese campaign, and for his other war services, Commodore Goodenough was created a Companion of the military division of the Order of the Bath on May 29th, 1875; and for his distinguished services in connection with the acquisition of the Fiji colony he was also made a Companion of the Order of St. Michael and St. George. He had previously received one of the good-service pensions.

Commodore Goodenough has been murdered by the savages of Santa Cruz. He was doing his plain duty in landing on the island, with his usual tact and sound judgment. He nobly fell, and we cannot help repeating the words of Captain Moresby, who served under him on the Australian station. Captain Moresby thus writes:—

"I will not speak of the loss his friends sustain in him, of his generous, genial, gallant nature, his almost womanly power of sympathy, his sound judgment, always at the service of a friend; I should but multiply words where they are not needed, for every man who called him "friend" knows that he was strong, gentle, true, incapable of the least littleness, able and willing for all good work.

"It will be no part of our sorrow that he has died obscurely,—a man can do nothing nobler than his duty, and he is sure to have been found doing that,—nor that his call has been, perhaps, sudden, for that pure and devout spirit was ever ready to enter the presence of its Maker; but we shall all lament that the future greatness—a greatness in which he would have been beloved—for which his fine sailor-like and scientific qualities, his grasp of mind, his promptness in action, seemed to destine him, has not been achieved. In this feeling I am sure that we, lately his officers, shall be joined by the whole of our profession—nay, by the nation at large, for already he had been recognized as no common man, and the loss is a national one."

Mr. E. J. Reed, C.B., also expresses the great loss that the country has sustained by the death of this lamented officer. He says:—"I have viewed with the greatest admiration the ability, the resolution, and the scientific spirit with which very many of our naval officers have adapted themselves to the altered circumstances of their profession. I could name several Admirals and numerous Post Captains and Commanders who now adorn the naval service by the display of a degree of skill and mastery of novel conditions for which we really were not entitled by our previous exertions in naval training to look with any confidence. Among this class of officers the now lamented Goodenough held a very prominent place. Although deficient in none of those vigorous qualities which win renown for naval men, he was a most thoughtful and scientific officer, acquainted with the latest developments of naval gunnery and war ship-building, and capable of rendering the best service to his country at a period when good service in the Navy demands the exercise of higher qualities in many respects than naval men ever before needed. His reputation was not confined to this country only, and the news of his death will have been received with more than a passing regret throughout the naval professions of Europe.

"It is sad to think of such a life as his being sacrificed by the treachery of a savage in a remote and obscure corner of the world; but the event should, I think, serve to remind those who need such a reminder, that it is not only faithful service which the country demands and receives from its naval and military officers; it is their very lives also that are offered to us whenever the public service may, even by its accidents, require them."

On August the 12th Commodore Goodenough landed at Carlisle Bay, on Santa Cruz Island, to open kindly intercourse with the natives. After a friendly conference, with an interpreter, of nearly an hour's duration, the Commodore was getting into his boat, when a savage, standing 4 yards off, treacherously fired a poisoned arrow at him, which struck him on the left side. The boats at once retired to the ship, and this good and valuable officer died eight days afterwards. The feeling of the service cannot be better expressed than in the words of Vice-Admiral G. Phipps Hornby, one of the Lords of the Admiralty. He says:—

"The most difficult part of Commodore Goodenough's work on the Australian station must have been to protect the natives of the South Sea Islands from the white men—some, I fear, our own countrymen—who proposed to gratify the prevailing lust for money by stealing and selling their fellow creatures. To effect this, small vessels have been specially fitted out to search among the islands for kidnappers. One of them a few months since visited Santa Cruz on that service. She was attacked, or threatened with attack by the natives, and, in defending herself, inflicted severe loss on them. Such a mishap was not likely to establish that confidence on the part of the natives which it is the business of the Australian squadron to cultivate. If they can persuade the natives that the men-of-war are friends and protectors, their difficult duties will be much facilitated. To effect this it probably appeared to Commodore Goodenough that the most likely course was to attempt to open a friendly correspondence with them, and that it should be done without risk of misconstruction on the part of the natives—that an imposing force, and not a small schooner, should visit their island. For these reasons, I presume, he went in the largest ship of his squadron.

* See our number for February, 1875, p. 47.

But it must have been clear to him that to land armed to the teeth with the weapons of whose power the natives have had but too much experience, would not lead to any conference at all. The natives would simply retire into the bush. He had, therefore, no chance of gaining his object unless he landed unarmed. It is absurd to suppose that so clear-headed a man was not fully alive to the personal risk he ran; but it would have been simply a negation of his previous career if such knowledge had caused him to hesitate in doing the duty which was straight before him. There is no reason to suppose that he landed without an interpreter. If he had, it is difficult to understand how the 'satisfactory progress,' which the telegram reports, could have been made. His immediate object was to open friendly intercourse. The service will think he took the only means open to him to effect it, and, in attempting it, he received his death wound. Probably Commodore Goodenough was a man who did not attach much value to public opinion, but I believe he would be sensitive to that of his brother officers, and his last moments were, I trust, cheered by the knowledge that they would endorse his action. In one sense we must bitterly regret his death. We have lost a strong and trusted leader, on whom we reckoned in case of difficulties. But the manner of his death we do not regret. He has added one more name by it to the long roll of those who have made the reputation of her Majesty's Navy by looking only to see where duty lay, and by doing it at whatever cost. His reputation is, and ever will be, dear to us."

All honour to Admiral Hornby for coming forward to express the true feeling of the service and of the country on the brave and wise conduct of his brother officer, which led to his lamented death.

Commodore Goodenough died on the 20th of August 1875, and the funeral took place at Sydney on the 24th. The country has lost a true and faithful servant, accomplished, brave, and self-forgetting—a loss, whether the country knows it or not, which it will be long before it can replace.

Goodenough had always, especially since 1865, taken a deep interest in the efforts of his old messmates, Osborn and Markham, to promote the renewal of Arctic exploration. It was Captain Goodenough who induced Commander Markham (then a young lieutenant) to volunteer for Arctic service in 1865. He saw that such service was conducive to the interests of the navy, and, in the true interests of the navy, he continued to encourage our efforts by every means in his power. There are none in the naval service who will mourn the loss of their old captain more deeply than several of the officers of the Arctic expedition when, hereafter, they receive the sad news. Commander Markham, Lieutenant Parr, and Lieutenant May were his shipmates in the 'Victoria,' and loved him as they could not fail to love one who had trained them in the service with such affectionate solicitude. Lieutenant Rawson served under him in the 'Minotaur' and shares the same feeling; as does Mr. White, the engineer in the 'Alert,' another of his 'Minotaur' friends. The story of the loss of Commodore Goodenough is a mournful, but a most appropriate prelude to our account of the start of the Arctic Expedition.

THE ARCTIC EXPEDITION.

I.

FROM PORTSMOUTH TO THE WAIGAT.

WHEN the two Arctic ships left the dockyard and steamed slowly out of Portsmouth Harbour on that bright afternoon of the 29th of May, there was such proof that the heart of the English nation was stirred to its core as has seldom been given even on the news of a great victory—never before on the departure of an expedition of discovery. The ringing cheers from the yards and rigging of the 'St. Vincent' and 'Duke of Wellington,' taken up and repeated by hundreds of boats, yachts, and steamers, which surrounded and followed the ships across the waters of Spithead gave forth no uncertain sound. But the most imposing sight was presented by the shore line, from the dockyard gate to Southsea Castle. It was a dense mass of human beings. The garrison, which was drawn up on Southsea Common, presented one thin red line, fringing the vast crowd, collected from far and near, to witness the departure of the expedition. This sympathising crowd represented the feeling of the whole people of England, who have now shown, in a way which cannot be mistaken, that the spirit of maritime adventure and discovery is as dear to them as it ever was to their ancestors. The despatch of the Arctic Expedition is a great and wise measure, which has received the complete and hearty approval of the nation.

The 'Alert' led the way round St. Catherine's Point, followed by the 'Discovery,' with the 'Valorous,' having additional coals and stores, to be transhipped at Godhavn, bringing up the rear. A fair easterly wind carried the expedition down channel; on the 1st of June the ships anchored in Bantry Bay, and on the 2nd the 'Alert,' 'Discovery', and 'Valorous' commenced the voyage across the Atlantic.

Officers and men had not been a day on board and together before the 29th; but all soon settled zealously to their work, each, in his place, preparing to do his share and to help his comrades to the utmost. They are now far away in the wild unknown region, and it is well that we should have them all and each in our memory, with the part that each is taking in this great national enterprise. Captain Nares is a leader to whom all on board are warmly attached, an able and most careful navigator and surveyor, and an admirable organizer of details. He also has the experience of two Arctic winters, and of two seasons of sledge-travelling, in 1852-54. Commander Markham, besides the duties of commanding officer, has charge of the magnetic observations, of those relating to the polarization of light, and has studied and practised surveying. But his most important work will be the organization of the winter routines and amusements, and of the sledge-travelling, under Captain Nares. As regards the latter duty he has carefully studied all the details of Sir Leopold McClintock's system during the last two years; while his experience of ice navigation, acquired in 1873, is recent, and has been obtained in the light of all modern appliances. Captain Nares and Commander Markham are the only two officers of the expedition who had previously crossed the Arctic Circle.

Lieutenant Aldrich is well versed in all matters connected with sounding and dredging, is a good

Map of Part of the NORTHERN ATLANTIC,

Showing the Tracks of H.M.SS.

'ALERT', 'DISCOVERY', AND 'VALOROUS',

1875.

The Sea is tinted according to depth, thus :—

0 - 100 fath:	1000 - 1500 fath:
100 - 500 "	1500 - 2000 "
500 - 1000 "	2000 - 2500 "

70° 60° 50° 40° 30° 20° 10° 0° 0

60 50

50° 40° 30° 20° 10°

DAVIS STRAIT

GREENLAND

LABRADOR

NEWFOUNDLAND

Hudson Str.

Cumberland Sound

Resolution I.

Godthaab

Frederikshaab

Lichtenau

Prince Albert

Christianshaab

Julianehaab

C. Farewell

Disko

Prinsens I.s

Upernivik

Jakobshavn

Holsteinborg

Sukkertoppen

Godthaab

Fiskenæs

Frederikshaab

Lichtenau

Julianehaab

C. Farewell

Scoresby 52

C. Dan

Terror I.

Denmark Str.

ICELAND

Jan Mayen

Elizabeth P.t

Faroe Oer

Shetlands

Orkneys

Rockall

Dublin

Portugine B.

Cork

C. Clear

Yeltrout

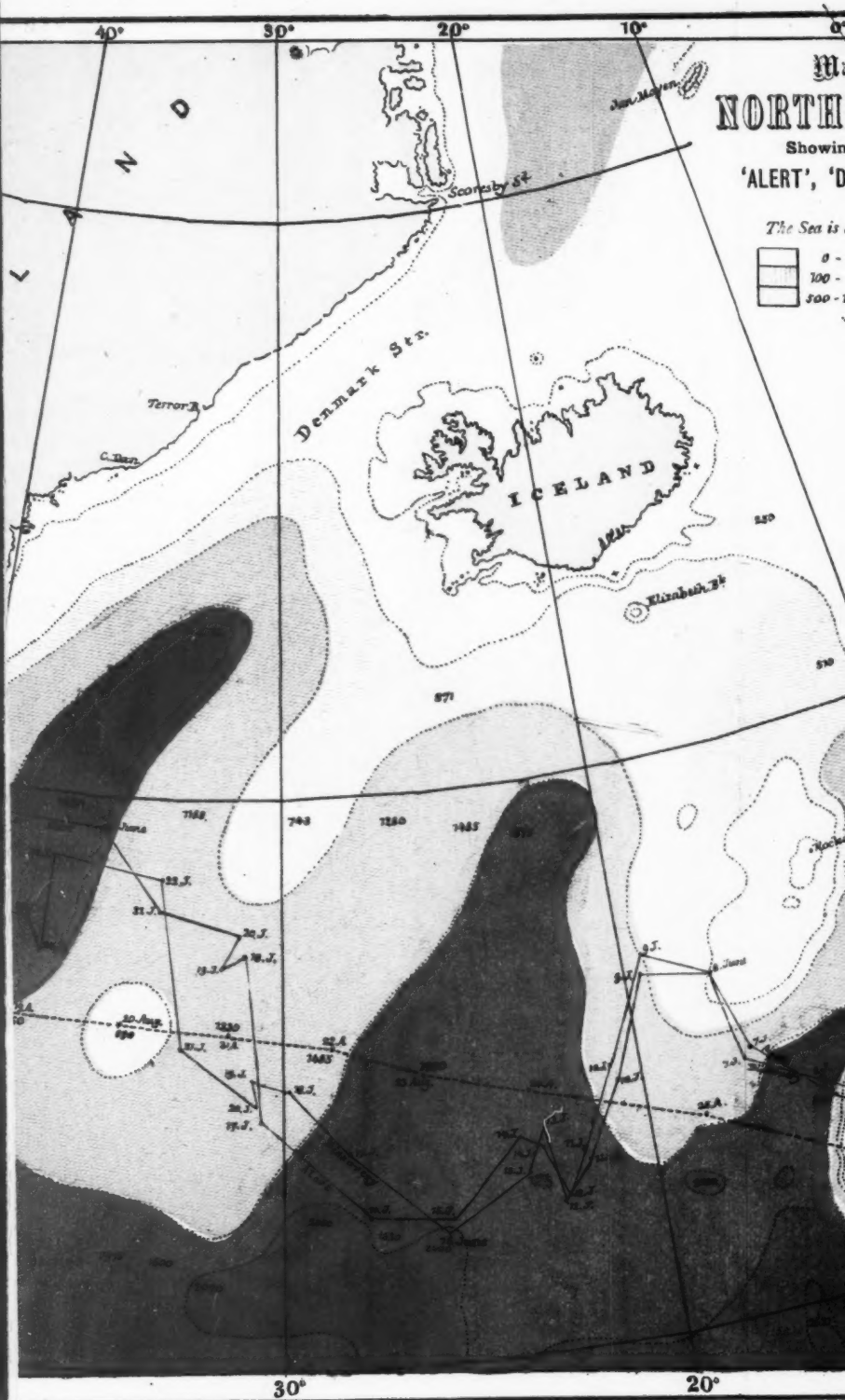
Alert & Discovery

Valorous

Alert & Discovery to Portsmouth

Valorous

E.G. Ravenstein, autogr.


40°
30°
20°
10°
Jan Mayen
Scoresby Sd.
Denmark Str.
Terror B.
C. Dan
ICELAND
Elizabeth B.
250
510
571
7160
7140
7250
7465
Thors
Rock
20. Aug.
1230
1465
30°
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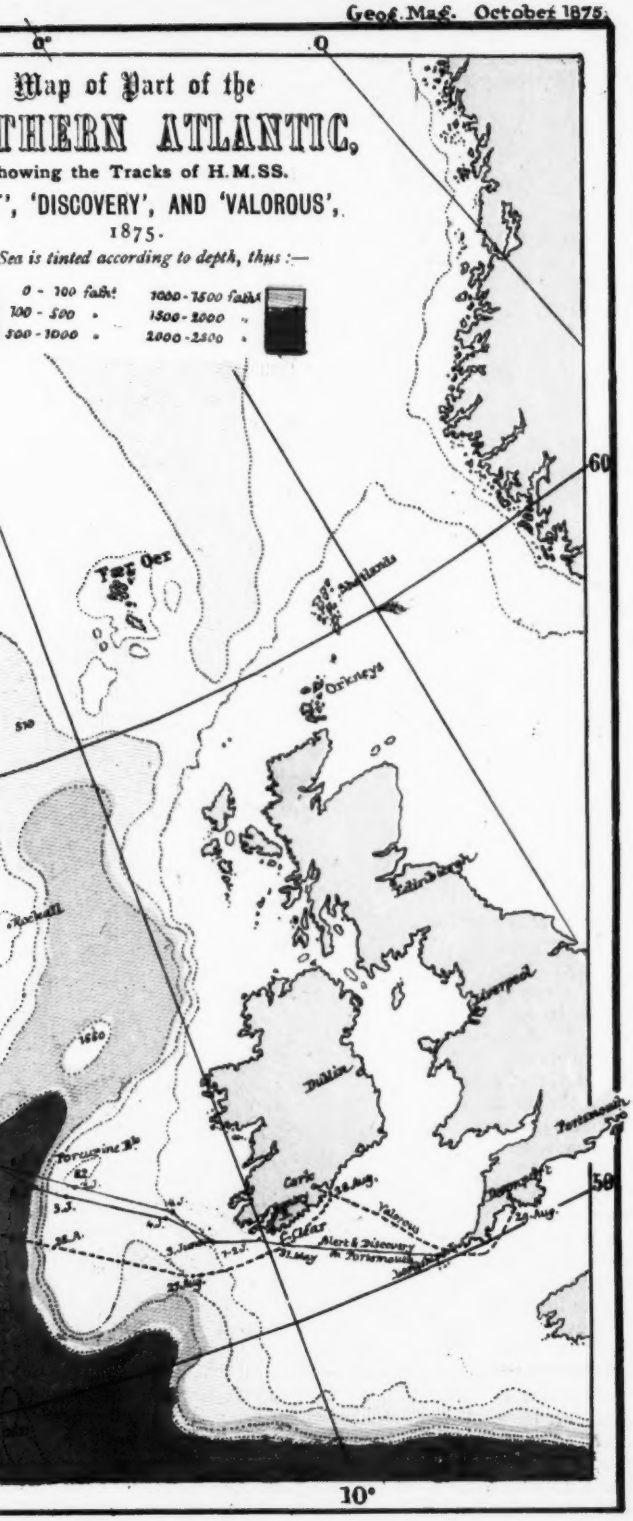
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THERN ATLANTIC,
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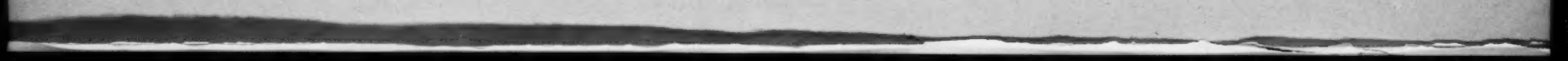
0 - 100 fath.
100 - 500 "
500 - 1000 "
1000 - 1500 fath.
1500 - 2000 "
2000 - 2500 "
0°
0
60
50
10°
Fair Oer
Shetlands
Orkneys
Rockall
1680
Dublin
Liverpool
Portsmouth
Cork
Queenstown
Falmouth
Valorous
Alert & Discovery
at Portsmouth
Torquine Bk
28 Aug.
29 Aug.
31 May
25 Aug.



observer, an excellent officer, and the best of messmates. Lieutenant Parr, a gunnery officer of great ability, has charge of the astronomical observations, and of those connected with spectrum analysis. Lieutenant Giffard assists Commander Markham with the magnetic observations, and has charge of the printing; and Lieutenant May, besides the navigating duties, has also gone through a course of instruction in spectrum analysis. Sub-lieutenant Egerton, in addition to his regular work, has undertaken the important and responsible duties of paymaster, including the preparation of depôts and all the calculations connected with provision and clothing supplies. All the executive officers, under Captain Nares, give close attention to the meteorological observations. Dr. Colan, the fleet-surgeon, fills a most important post. He watches over the hygiene of the ships, and the health of officers and men, registers all statistical data with careful accuracy, and is a good ethnologist. He will observe for the presence of ozone, and will take other observations of scientific value. Dr. Moss is an officer of high scientific attainments, more especially as regards the study of minute organisms, and is a practised microscopist. He is a good artist, and excels in the drawing and colouring of objects under the microscope. He is also the inventor of an admirable plan for procuring microscopic objects in sea water, by means of a siphon, at the entrance of which a few fibres of cotton-wool are placed. Captain Feilden, recently paymaster in the Royal Artillery, is a good ornithologist and had studied the birds of the Faröe Islands during a visit in 1872. He has also acquired much general scientific knowledge, is an excellent messmate, and a very valuable addition to the staff of the expedition. Mr. Wootton, the senior engineer, is an experienced officer; and the second engineer, Mr. White, is the photographer of the 'Alert,' and is an officer of resource and some inventive talent. To the above twelve officers, a chaplain has been added. Mr. Pullen, the chaplain, has studied botany, and has a good knowledge of the English flora.

Besides the officers, the complement of the 'Alert' is made up of 48 men. There are eight chief petty officers; namely, Joseph Good, the chief boatswain's mate, who was Captain Nares's coxswain in the 'Challenger;' John R. Radmore, the chief carpenter's mate; George S. Burrows, the ship's steward; Vincent Dominich, the ship's cook, a native of Gibraltar; Colour-Serjeant Wood of the Royal Marines, who is a photographer and assistant to Mr. White; and the three Scotch ice quarter-masters. Of these latter the oldest is John Thores of Peterhead, a harpooneer; John Berrie of Dundee, was a boat-steerer in the 'Erik,' with Captain Walker; and David Deuchars of Dundee is an old shipmate of Commander Markham in the 'Arctic,' where he was a loose harpooneer in 1873 and 1874.

The petty officers of the first and second class are eleven in number. Thomas Rawlings, the captain of the forecastle, an old shipmate of Commander Markham in the 'Blanche,' is an excellent seaman and has the largest girth of chest of any one in the expedition, namely, 41½ inches. The other captain of the forecastle is Edward Lawrence. The captains of the main-top are James Doidge, who has just passed a very creditable examination for boatswain, and Daniel Harley who was in the Ashanti expedition: of the fore-top, Thomas Jolliffe and Thomas Stuckberry. Adam Ayles and John Simmons are second-class petty officers, doing duty as forecastle men. Frederick Cane, the armourer, served in the Ashanti campaign, as did Robert Joiner the leading stoker, and John Hawkins is cooper and captain of the hold. Of the fourteen able seamen Alfred Pearce, William Ferbrache a native of Jersey, John Pearson, Thomas Simpson, Robert Symons (who is Lieutenant Giffard's assistant in printing), and William Malley, a signalman, who served in the Ashanti campaign and gave up his rate to join the expedition, are seaman-gunners. William Woolley, another signalman, also gave up his rate to join the expedition, as did William Lorimer, who had previously been a leading seaman. The others are George Cranstone a native of Edinburgh, James Self, William Marshall, Reuben Francombe, David Mitchell, and George Winstone a young lad—a nephew of Good the chief boatswain's mate—who also came from the 'Challenger.' The three stokers are W. J. Gore, John Shirley, and Edward Stubbs a native of York and a good blacksmith. Henry Mann is the shipwright, and George Norris, capenter's crew. Spiro Capato, the captain's steward, a native of Cephalonia, was with Captain Nares in the 'Challenger.' The ward-room steward, George Kemish, is an excellent man, an indefatigable worker, full of resource and ready to put his hand to anything; and W. F. Hunt is the ward-room cook. The marines are William Ellard, Thomas Smith, and John Hollins; and the gunners Elias Hill, George Porter, and Thomas Oakley, each being servant to two officers.

The average age of the officers is 31, of the chief petty officers 31, of the other petty officers 29, and of the able seamen 23. The average weight of the officers when the expedition sailed was 150 lbs., girth of chest 37 inches, capacity of chest 262 cubic inches, and height 5 feet 9 inches. Of the men the average weight was 147½ lbs., girth of chest 37 inches, capacity of chest 253 cubic inches, and height 5 feet 6¼ inches. These measurements were taken on leaving England, for comparison with similar measurements to be taken after the winter, and again after returning from sledge-travelling.

The 'Discovery,' commanded by Captain Henry Stephenson, has an executive staff of four lieutenants and one sub-lieutenant. The first is Lieutenant Lewis A. Beaumont, a gunnery officer, who, in addition to his duties as commanding officer, undertakes the navigating duties and has charge of the pendulum observations. In the latter work he is assisted by Lieutenant Wyatt Rawson. Lieutenants Archer and Fulford undertake the magnetic observations; and Sub-lieutenant Conybeare has received instruction in spectrum analysis. Dr. Belgrave Ninnis, besides his important duties as senior medical officer, undertakes the charge of the meteorology; and Dr. Coppinger is a geologist and naturalist. The engineers are Mr. Cartmel and Mr. Miller, and Mr. Thomas Mitchell, the assistant paymaster, is the photographer, and is also a good artist. Mr. Hodson is the chaplain, and Mr. Hart, a student of Trinity College Dublin, has a knowledge of botany.

The chief petty officers of the 'Discovery' are George W. Emerson the chief boatswain's mate, a native of Hull; Edward C. Heddy the chief carpenter's mate, George R. Sarah the ship's steward, George

Leggatt the ship's cook, Serjeant Wellington of the Royal Marine Artillery, and the three Scotch ice quarter-masters. Of the latter Alexander Gray of Peterhead has already wintered within the Arctic circle, and William Dougall of Peterhead and Edward Taws of Dundee were harpooneers. The other petty officers are Frank Chatel and Thomas Simmonds, captains of the forecastle, George Bryant, George Bunyan an old shipmate of Commander Markham in the 'Victoria,' James Cooper, George Stone, David Stewart, William Ward the armourer, James Shepherd the cooper, and Jeremiah Rourke the leading stoker. The able seamen are John E. Smith, Alfred Hindle, Thomas Chalkley, Michael Regan, John Hodges, Peter Craig, R. W. Hitchcock, Daniel Gerard, H. W. Edwards, James Thornback, John S. Saggers, and Benjamin Wyatt who has charge of the printing. Another able seaman from the 'Valorous,' named Paul, was added to the complement of the 'Discovery' at Godhavn. The stokers are Frank Jones, Samuel Bulley, and William R. Sweet. Henry Windser is carpenter, Jonah Gear the ward-room steward, and James Phillips, the ward-room cook, aged 20, is a native of York, and the youngest man in the expedition. The marines are John Murray, Thomas Darke, Henry Petty, and W. Waller, and the gunners John Cropp, Eli Rayner, and Wilson Dobing, a native of Selby near York.

The average weight of the officers of the 'Discovery' is 151 lbs., girth of chest 36½ inches, capacity of chest 257 cubic inches, and height 5 feet 8¼ inches. Of the men the average weight is 148 lbs., girth of chest 36½ inches, capacity of chest 223¾ cubic inches, and height 5 feet 6 inches. All the officers of the expedition are Englishmen, except the two medical officers of the 'Alert' and one of the 'Discovery' who are Irish. Besides the six ice quarter-masters, there are five Scotchmen and three Irishmen. All the rest of the men are English, of whom 22 are from the west country, 18 from Portsmouth and other places in Hampshire and Sussex, 7 from midland counties, 9 from London, 5 from the Isle of Wight and Channel Islands, and 6 from Yorkshire.

The ships were necessarily very heavily laden and deep in the water, and it was no easy matter to stow three years' provisions and coals in vessels where so large a space is occupied by the engine-room. The weight of the provisions on board the 'Alert' is 136 tons, of which 55,808 lbs. are liquids and 249,801 lbs. solids, besides 178 tons of coal. The provisions and stores of the 'Discovery' are on the same scale: the ships being nearly the same size. The 'Alert' is 751 tons, 160 feet long, 33.4 broad, 17 depth of hold, and 15 feet 7 inches mean draft: the 'Discovery' 668 tons, 166 feet long, 30 beam, 18 depth of hold.

Provisions on board H. M. S. 'ALERT.'

	lbs.
Salt pork	17,100
Salt beef	17,100
Suet	1,050
Bacon	3,720
Pemmican (sweet)	3,752
Pemmican (plain)	3,800
Fine salt	144
Chocolate (ordinary)	2,950
,, (soluble)	650
Mustard	300
Pepper	140
Celery-seed	25
Meat biscuit	1,100
Flour (raw)	26,000
,, (kiln dried)	27,750
Split peas	4,160
Oatmeal	84
Candles (8s)	2.850
,, (24s)	750
,, (signal)	50
Boiled beef	6,372
Cocoa-nut stearine	1,903
Roast beef	6,480
Boiled mutton	6,480
Roast mutton	6,480
Rump steaks	3,240
Minced collops	3,240
Ox cheek & vegetables	4,260
Hotch potch	4,260
Onions	2,832
Carrots	5,640
Compressed vegetables	544
Dried cabbage	544
Chilies	5
Culinary herbs	24
Haddocks	100
Maccaroni	112
Condensed milk	192
Chocolate and milk	56
Curry paste	50
Baking-powder	100
Essence of beef	36
Normandy pippins	1,210
Preserved gooseberries	1,212
,, rhubarb	1,212
Cocoatine	56
Pickled onions	777
,, walnuts	840
,, cabbage	816
,, gerkins	872
,, piccalilli	777
Preserved potatoes	6,050
Extract of meat	25
Egg powder	14
Preserved fowl	250
Calves-foot jelly	24
Apple jelly	45
Malt	400
Hops	24
Dog biscuit	4,690
Onion powder	50
Raisins	1,058
Arrowroot	59
Pearl barley	112
Oysters	250
Tapioca	56
Loaf sugar	224
Sago	112
Cloves	3
Nutmeg	3
Sugar	12,250
Rice	112
Tea	887
Tea (compressed)	112
Pickled garlic	25
Biscuit	21,350
Boiled bacon	2,240
Tongues	180
Black currants } Red ,, }	18 bottles
Vinegar	51 gallons
Lime juice	4,250 ,,
Safety matches	3½ gross
Friction papers	500
Candles	10,550
,, fighting	6,250
Soap	in 21 cases
Cavendish tobacco	596 lbs.
Shag ,,	500 ,,
Leaf ,,	1,290 ,,
Rum	1,366 gallons
Port wine	29 ,,
Sherry	27 ,,
Brandy	28 ,,
Gin	30 ,,
Whiskey	25½ ,,
Champagne	48 bottles
Allsopp's ale	10 hogsheads
Ground coffee	420 lbs.
Methyllated spirits	46 gallons
Mustard-seed	16 lbs.
Cress-seed	9 ,,

It had evidently been expected and anticipated that a fair passage would be made across the Atlantic, for the ships were in their heavily laden condition, with small complement, and jim-crack inventions aloft for saving labour, but ill adapted for encountering bad weather. Heavy skids are built over the quarter-deck, on which were placed three of the largest boats, besides planking, sledges, and other gear. The boats on the skids were the yawl (10 oars double banked, with a dipping lug, foresail, and mizen, length 25 feet, breadth 6 feet 6 inches, depth 2 feet 5½ inches, weight 1250 lbs.), and two ice-boats (6 or 8 oars double banked, built to go on sledges; of cedar and elm carvel and diagonal, with sheet copper on the bows, 20 feet long, 6 feet wide, 2 feet 6 inches deep, weight 739 lbs). And there were six boats at the davits, three on each side. The cutter was at the starboard quarter-deck davits (8 oars doubled banked, length 23 feet, breadth 6 feet 2 inches, depth 2 feet 4 inches, weight 1014 lbs.), a smaller ice-boat (15 feet long, 4 feet 6 inches wide, 2 feet 1 inch deep, weight 493 lbs.), three whale-boats beautifully constructed but very fragile, two of which were completely fitted for whaling (4 oars single banked, length 25 feet, breadth 5 feet 2 inches, depth 2 feet 3 inches, weight 717 lbs.), and a small punt (length 12 feet, breadth 4 feet, depth 1 foot 10 inches, weight 224 lbs); besides Mr. Berthon's collapsible canvas coracle (weight 56 lbs., length 6 feet, width 3 feet 6 inches, depth 1 foot 4 inches).

The 'Alert's' engines are of the horizontal direct-acting type, with two compound cylinders, and surface condenser. Although only 60 H.P., they are capable of developing 570 H.P. when working at full power. The two boilers are cylindrical with return tubes, and there are two furnaces to each. The propeller

(Griffiths), with two blades, having a diameter of 10 feet and pitch of 8 feet 6 inches, is fitted without any framework, and is raised by means of a purchase that is hooked to a hole in either fan. The shaft is on the telescopic principle, and is withdrawn from the boss by means of a ratchet and pinion. The number of revolutions obtained at maximum speed, at the trial, was 120; and a distance of 22 miles was attained at a consumption of one ton of coal. The mean speed over the measured mile 7.684, and the consumption of coal per hour was 778.28 lbs. or 2.48 lbs. per T.H.P. per hour. The indicated H.P. 313.36 and nominal 60. The engines were manufactured by Messrs. Hawkshaw, of Newcastle, for the gunboat 'Cygnet' in 1874, and transhipped to the 'Alert' in March 1875. There is a steam winch on the upper deck.

For the first day or two, after leaving Bantry Bay, there was a fair prospect of a good passage, but on the 4th of June it began to blow from the west; and during the whole voyage the expedition encountered contrary winds with very heavy weather. No Arctic expedition on record has had so long or so boisterous a passage across the Atlantic; yet this was not without its countervailing advantages. All the gear aloft was thoroughly tried, all things below were shaken into their places, and the men, amidst discomfort and hard work, more quickly formed that brotherhood upon the strength of which so much depends. Their appreciation of the nature of the service, and general good feeling was shown by many little things. For instance, on the 1st of June the petty officers came aft, and requested to be allowed to take their turn at the wheel, with the rest of the men. Sea boots and fur caps were served out during the first week, and in the forenoons every man comes on deck to drink his ounce of lime-juice, which is of excellent quality. The scale of diet for each man is 1 lb. of biscuit every third day, and 1 lb. of flour for bread on each of the two intervening days: every other day 1 lb. of corned-beef or corned-pork alternately; and on the intervening days ¾ lb. of preserved meat and ¼ lb. of salt meat: every fourth day 1 lb. of compressed vegetables, and on the others ¼ lb. of preserved potatoes: ½ lb. of preserved soup every fourth day: ¾ lb. of flour, suet, and raisins every fourth day: ¼ lb. of split peas every fourth day, with ½ oz. of celery-seed to every 8 lbs. of peas: 1 oz. of chocolate, ¼ oz. of tea, 1¾ oz. of sugar, 1 oz. of lime-juice, with 1 oz. of sugar for lime-juice, 1 oz. of pickles, and ¼ gill of rum daily: ½ oz. of mustard, ¼ oz. of pepper a week, 2 ozs. of preserved fruit, and ¾ oz. of sugar for fruit twice a week; and oatmeal, vinegar, and salt as necessary. It is intended to add ¼ lb. of preserved meat on salt-meat days, so as to give some fresh meat every day. For the salt beef is hard, dry, and very bad, and it enters but too largely into the scheme of diet.

The bad weather began on the 11th of June, when the north-westerly wind increased to a gale, with occasional violent squalls, and the 'Valorous' parted company to make the best of her way to Godhavn. On the 12th it fell calm with a heavy swell, but on the 13th all three ships encountered a gale of unusual strength, undoubtedly portion of a cyclone travelling rapidly to the eastward. The 'Alert' was steering north in the south-east side of the circular storm, the vortex of which was moving to the north-east. The wind was consequently from the north-west, freshening rapidly with violent squalls and a high confused sea. At noon the latitude was 53° 41′ N. and longitude 23° W. In the evening it was blowing a whole gale, barometer falling rapidly. Green seas where coming in fore and aft, and both ward-room and lower deck were flooded. She was evidently very close to the vortex of the storm, and at 10 P.M. the barometer had fallen to 28.82. At the same time the ship was wore, and took in a green sea over the stern. Almost simultaneously the wind shifted to the north, showing that the 'Alert' had been within a very short distance of the vortex, and that she was now on its western side. The barometer began to rise again, but the gale from the north continued through the night. The fowls were all drowned, and the sea was washing about in the ward-room, where, after midnight, an enthusiastic naturalist might have been seen fishing for new organisms out of his cabin, with a hand-net. But they proved to be buckwheat washed out of the hencoops. More serious damage was done by the storm on deck. The skids, with the boats on them, worked very heavily, and the whale-boat, hoisted up to the davits on the starboard side, was stove in and destroyed. On the 15th the wind gradually died away to nearly a calm; but on the 17th there was another gale of wind from the west-north-west with a heavy sea, the ship lying to, and drifting to leeward. On the 20th the gale continued, heavy seas coming in over the forecastle and washing fore and aft, and the cutter was nearly lost, being caught by a sea and half filled. A succession of gales with heavy seas continued until the 27th, when the 'Alert' was at length to the westward of Cape Farewell, and making for Cape Desolation on the west coast of Greenland.

It was on the 27th of June that the first ice was seen, a sight which was new to most of the explorers, and which gladdened their hearts. Mr. Egerton was officer of the watch, and, charging a formidable block, he was the first to make the ship touch ice at 5 P.M. On the 28th the 'Valorous' was sighted, and the land round Cape Desolation, lofty snow-covered ridges and peaks with clouds hanging over them. This land is the most interesting in Greenland. For here the old Norse colonies were planted, and this coast was first touched at by Sir Martin Frobisher, who named it "Charing Cross," and afterwards by John Davis, who gave it the name of "Desolation."

During the following week the ships passed close along the Greenland coast, sighting all the peaks and headlands and entrances to fiords; which excited much interest on board. The officers of the expedition were most anxious to acquaint themselves with the history of Greenland and of its inhabitants, a land which forms, as it were, the basis of their own future discoveries further north. But this natural desire for information could not be gratified, owing to an oversight in not supplying a proper Arctic library for the use of the expedition. There are about 70 Arctic books that ought to be available for reference, of which only 40 have been supplied; while the missing works include all those relating to Greenland, such as Fabricius, Hans Egede, Crantz, Graah, Rink, Kleinschmidt, Janssen, Trevelyan, and the vocabularies specially prepared for Arctic expeditions by Admiral Washington. The complete sets of volumes presented by the Hakluyt Society make up for some of the deficiencies, as regards the earlier Arctic voyages,

and a few others can fortunately be supplied from the private libraries of the officers.

On June 29th, from daylight until 10 A.M., the 'Alert' was passing through a stream of very heavy floe-pieces, and sustained several severe bumps which brought the ship up all standing. Some of the pieces were 200 or 300 yards long, others were fragments of pressed up hummock-ridges from 30 to 40 feet high. Many were worn into fantastic and beautiful shapes, the wash of the sea having frequently worked laterally into the ice-blocks until they consisted of two floors connected by ice-pillars of the deepest blue. This old ice was streaming round from the east coast of Greenland with the current which is usually lost or deflected again near the Arctic circle. The ship was clear of the ice before noon, and on the following night a gale of wind came on, and a very heavy confused sea with high perpendicular waves, which made her roll gunwales under and ship seas over the stern and forecastle. Everything began to fetch way, a tremendous sea came down into the ward-room, the masts laboured heavily, and there were several leaks from the upper deck. The 1st of July was a lovely day, and in the afternoon the 'Discovery' was sighted about 10 miles in-shore. She had parted company during the cyclone of June 13th, had experienced the same weather, and had shaped almost the same course, but was actually in the ice during the gale of wind of June 29th.

The long succession of heavy gales has tried the gear of the ships, and has left various marks. Two valuable whale-boats have been stove-in and destroyed, one in each ship. In the 'Alert' the iron main-truss, the patent wire rudder-chains, and the chain tyes of both topsail halliards were carried away; and the iron try-sail masts were started on all three masts. The patent gear on the foretopsail-yard was of bad iron, and the span connecting the spindle at the end of the reefing boom with the yard also carried away. The yard could not be shifted, as not a burton nor a sail tackle had been supplied, and there was no tackle long enough to send a topsail-yard down. All night, during the gale of the 29th, Kane the armourer and Stubbs the blacksmith were at work in the engine-room forging a new iron span for the topsail-yard, with the water washing up to their knees; for it is one great disadvantage of having placed the engine-room so low in the ship, almost on the flooring, that it becomes flooded during every gale of wind.

After the 1st of July the 'Alert' and 'Discovery' proceeded up the coast in company, passing Sukkertoppen on the 3rd, Holsteinborg, with all its dangerous outlying rocks and reefs, on the 4th, and the grounded icebergs off Rifkoll on the 5th; and on the morning of July 6th the 'Alert' and 'Discovery' anchored in the harbour of Godhavn or Leively, at the south-west end of the island of Disco, where the 'Valorous' had arrived on the previous Sunday evening, July 4th. Godhavn is the principal Danish colony of North Greenland, and the residence of the Inspector, Mr. Krarup Smith, as well as of Mr. Elborg, the Governor.

The island of Disco is, in several respects, an excellent locality for acquiring a first impression of the Arctic Regions and of their flora and fauna, while the geology presents points of special interest. It is here that the volcanic formations overlie the gneiss, and the basalt presents sections in some of the ravines which were carefully studied; especially one described by Giesecké in a deep gorge above Englesmanders Havn, where the layers of columnar basalt and amygdaloid with mesotype may be seen resting on the gneiss. The points were noted where the gneiss formation disappears, near Fortune Bay on one side, and two miles from Godhavn on the other, and the mineralogy both of the basaltic and gneissose rocks was carefully observed. Here also there were special advantages for studying Arctic physical geography, the effects of frost and ice upon the rocks, the influence of summer rivers, the glacial phenomena, and those connected with the formation, drift, and breaking up of icebergs. From the summits of the Lyngmarkensfjeld, 2300 feet above the sea, which overhangs the harbour of Godhavn, there is an enchanting view of Disco Bay, dotted with hundreds of bergs, and the fiord of Jacobshavn with its great discharging glacier, whence the icebergs were drifting in a continuous stream, was clearly visible. The Arctic officers eagerly examined and studied these phenomena, climbing the treacherous basaltic mountains, exploring the wild gorges, and crossing the flooded torrents. Icebergs were visited, as well as the coast at Ovifak, whence the Swedes carried off the now famous meteoric stones in 1871.

The valleys and gorges of Disco, especially the Lyngmarken and the shores of Englesmanders Havn, in their gay summer clothing of mosses and wild flowers, furnish an excellent example of the *flora* of both North and South Greenland, both of the plants which will become familiar to the explorers further north, and of the less hardy species which do not occur beyond this parallel. Of the 206 species which compose the Arctic Greenland *flora*, upwards of two-thirds were collected by the officers of the expedition round Godhavn, and they were thus enabled to form a practical acquaintance with the plants they are likely to meet with in the unknown region. The vegetation covers the ground in thick masses, forming turf on the level places, while it fills the chinks and crannies of the rocks, and creeps over the surface of the stones, giving a very bright appearance to the near view of this land of Disco in summer. The prettiest thing of all, and the most abundant, is the club-moss (*Cassiope tetragona*) with its graceful little white bell-flowers, like miniature lilies of the valley. With it are generally the dwarf willows and birches, and the *vaccinium* with its red flower and glossy little leaves. But for the plague of mosquitos these soft masses of vegetation would form most luxurious beds. The *Alchemillas*, the *Angelicas*, and whortle berries in the Lyngmarken, and the rich masses of holly fern in Englishman's Bay, will not be seen further north. But with them are many true polar flowers—the erect red blossom of *Pedicularis laponica*, and the yellow, tinging to orange, of another species *P. flammea;* the bright little saxifrages red and white, *S. oppositifolia* and *cæspitosa*, the lovely *Dryas octopetala*, the familiar dandelion, the buttercup-like *Potentilla nivea*, the rather scarce *Ranunculus hyperboreus* with its yellow flower, the tiny white *Draba alpina*, the specially Arctic poppy, *Papaver nudicaule*, the *Silene acaulis* with its pretty little purple flowers level with beds of moss, the sweet-smelling *Ledum palustre*, and the showy purple blossoms of the *Epilobium alpinum*. Quantities of red snow were also found on the heights above Godhavn, and specimens were

carefully collected and preserved. Here too were the salad-supplying plants, the sorrel and scurvy grass, and many others. The herbaria formed at Godhavn will be most useful to the explorers, in studying the botany of the unknown region.

Disco is also a specially good locality for commencing the acquisition of a knowledge of the polar fauna; for here the Arctic and the sub-Arctic forms meet. Great northern divers, razor-bills, puffins, harlequin ducks, mergansers, skuas, wheat ears, pipits, and some phalaropes and sandpipers are seen at Disco, and not further north. At the same time the officers of the expedition here became acquainted with most of the true Arctic birds—the falcon (*Falco candicans*), the wheatear (*Saxicola œnanthe*), the two species of snow-bunting and their eggs (*Plectrophanes nivalis* and *laponica*), the raven (*Corvus corax*), the ptarmigan (*Lagopus rupestris*), the red phalarope (*Phalaropus fulicarius*), the purple sandpiper (*Tringa striata*), the Arctic tern (*Sterna hirundo*), the kittiwake (*Rissa tridactyla*), the glaucous gull (*Larus glaucus*), the skua (*Stercorarius parasiticus*), the fulmar or mallemoke (*Procellaria glacialis*), the dovekey (*Uria grylle*), the loom (*Alca arra*), the red-throated diver (*Colymbus septentrionalis*), the cormorant (*Phalacrocorax carbo*), the long-tailed duck (*Harelda glacialis*), and the king and eider ducks (*Somateria spectabilis* and *mollissima*); as well as with the eggs of many of them. Dr. Moss had examined many organisms brought from the surface water of Davis Strait, and the contents of a dredge containing molluscs, holotheria, and crustacea from 30 fathoms on the Torske bank; and he had made careful coloured drawings of all the microscopic organisms that were new to him. With reference to the scientific labours of the expedition, Captain Nares issued a very judicious memorandum to Commander Markham and the other officers, at Godhavn. In order to render the scientific results of the expedition as valuable as possible, he expressed reliance upon the co-operation of each member to assist in forming and preparing natural history collections. While the most important specimens will be required hereafter for the general national collection, any supplementary collection will, after a proper inventory is made of it, for publication in the general account of the voyage, be at the disposal of the collector. Any paper or description composed for the information of any learned society will be forwarded to its destination, through the Secretary of the Admiralty, by the earliest opportunity as an original paper by the writer.

Commander Markham and Lieutenants Giffard, Archer, and Fulford, were fully occupied with magnetic observations during several days, obtaining satisfactory independent results for dip and variation; and Captain Nares with Lieutenant May fixed the position of Godhavn, and made a survey. Other instruments were also tried, while Mr. White and Mr. Mitchell got to work with the photography, and obtained seven excellent negatives.

The Arctic Expedition was at Godhavn from the 6th to the 15th of July, busily engaged in filling up with coals and provisions from the 'Valorous'; and receiving most hearty and cordial assistance from her captain and officers. The 'Alert' had 178 tons of coal on board when she left England, and had expended 44 in steaming, condensing, and cooking before reaching Godhavn. She had condensed 36 tons of water with 6 tons of coal. She thus had 136 tons left, and received 66 from the 'Valorous,' making a total of 200 tons. Of this 114 tons is steaming coal, sufficient, with an expenditure of 4 tons a day (the quantity required for a rate of 5 knots an hour) for 29 days' steaming. The rest, 86 tons, is for cooking and warming. The additional provisions from the 'Valorous' were taken in:—

Salt beef	3000 lbs.	Preserved beef	6372 lbs.
Salt pork	3300 ,,	Preserved carrots	1656 ,,
Boiled bacon	2240 ,,	Rum	784 gal.
Sugar	4000 ,,	Flour	18,000 lbs.
Peas	2240 ,,	Biscuits	5500 lbs.
Dog biscuit	4000 ,,	Candles	16,800
Lime juice	1400 ,,	Sperm oil	30 drs.

The 'Alert' also received much gear from the 'Valorous,' and two boats, a four-oared whale-boat, and a jolly-boat with oars complete, besides the little canvas coracle belonging to Captain Loftus Jones, which will prove very useful in sledging operations.

The 'Discovery' then filled up, and there was nothing that the officers of the 'Valorous' were not ready to supply, from a topmast to a harmonium. On completing this work, Captain Nares addressed an official letter to Captain Loftus Jones, expressing his warm appreciation of the obliging assistance the expedition had received from the 'Valorous,' and specially thanking Mr. Eyre the first lieutenant, Mr. Gain the paymaster, and Mr. Coade the chief engineer.

Mr. Krarup Smith, the Inspector of North Greenland, and Mr. Elborg, the Governor of Godhavn, were most anxious to furnish all the aid in their power. They had received orders from the Danish Government respecting the supply of dogs, and 24 good Greenland dogs were ready for embarkation at Godhavn and 20 at Ritenbenk. Mr. Krarup Smith also supplied the expedition with a large net for catching white whales. The 24 Godhavn dogs were taken on board the 'Alert,' besides 9 sheep from the 'Valorous'; and at 4.45 P.M., of Thursday the 15th of July, the Arctic Expedition left Godhavn with the intention of going up Disco Bay to Ritenbenk, passing down the Waigat between Disco and the Noursoak Peninsula, and thence onwards to Upernivik. The 'Alert' proceeded with the 'Discovery' in tow, and Mr. Krarup Smith on board, followed by the 'Valorous.' The crows' nests were in their places, and the boats (no longer on the skids as when crossing the Atlantic) were all hoisted up to davits.

The surface of Disco Bay was like glass, and was dotted over with icebergs of great size and most fantastic shapes, while to the left rose the basaltic cliffs forming the south shore of Disco, resting on the yellow sandstones of the miocene period, which contain coal. At midnight of the 15th the 'Alert' passed close under the landward face of a magnificent iceberg, a cliff of dazzling white, the top of which was covered with *mollies*, which flew up in a great cloud. On the other side the berg rose to a peak 200 feet high, under which there was a grand arch, the inner sides being of a deep rich blue. The sea was smooth as glass, and the sky, seen through the arch, was crimson tinged with gold. As this scene of wondrous beauty presented itself, the 'Valorous' hove in sight through the arch, her dark hull and tall masts standing out against the

brilliant sky. In another hour there was a dense fog, which cleared away towards morning, disclosing a fine panoramic view with glassy sea and cloudless sky. On the left were the high basaltic rocks of Disco with the opening of the Waigat full of icebergs, ahead the lofty mountains of the Noursoak Peninsula, and to the right the gneiss cliffs and precipices of Arve Prins Island.

Passing the settlement of Ritenbenk the expedition anchored in a deep fjord extending up to the foot of the central chain of Arve Prins Island. The 'Discovery' here received her 20 dogs, good serviceable animals. Neil Christian Petersen was engaged as dog-driver in the 'Alert' and came out from England. He is a Dane aged 36, who had been cooper at Upernivik and served in the expedition of Dr. Hayes in 1860-61. An Eskimo named Frederik was engaged at Godhavn, as second dog-driver, and came on board with his kayak and the dogs at Godhavn. It was intended to try and engage the Eskimo Hans, then settled at Proven, who was in all three American expeditions up Smith Sound, as dog driver for the 'Discovery.'

During the afternoon of the 16th, Commander Markham, with Lieutenant Parr, Mr. Egerton, and Dr. Moss, took a party of men in two boats to Svartefugle Bay, on the north-west coast of Arve Prins Island, where there is a "loomery," and succeeded in bagging 75 looms, dovekeys, and razor-bills,* sufficient to supply officers and men with excellent fresh meat for two days. Other officers were away fishing, and exploring the islands.

The 'Valorous' was to sail at 4 the next morning, and proceed to the Ritenbenk Kulbrud, on the Disco shore of the Waigat, to coal; and the discovery ships were to follow two hours later. The 16th of July was, therefore, the last day on which the gallant explorers would see any of their countrymen. At midnight the captain and officers of the 'Alert' assembled in the ward-room to bid farewell to one who had been their messmate thus far, and who was the last Englishman whose hand they would grasp for many a long day. Healths were drank in bumpers of champagne, three hearty cheers from officers and men sent their echoes over the fjord, and their last-seen friend was pulled on board the 'Valorous,' at one in the morning of July 17th, by the four lieutenants—Aldrich, Parr, Giffard, and May, with Commander Markham at the steer-oar.

The 'Valorous' sailed from Ritenbenk at 4 A.M. of July 17th, the 'Alert' and 'Discovery' following; and at 8 A.M. the Arctic ships could be made out from the stern of the 'Valorous,' with their mast-heads and yards showing above the icebergs. At 1 P.M. the 'Valorous' anchored off the coal-bearing cliffs, on the Disco shore of the Waigat. From the hills there was a magnificent view of icebergs streaming out of the Tossukatek Fjord, at the head of which there is a great discharging glacier, and down the Waigat, and among them the Arctic ships could be seen, over on the Greenland side of the strait, under all plain sail. They were standing down the Waigat (the 'Alert' leading), appearing and disappearing behind the huge icebergs, about 6 miles off. At 5 P.M. the 'Valorous' hoisted a signal at all three mast-heads—*Farewell! Speedy return!* It was not seen for a long time, but at last the 'Discovery' hoisted *Thank you*, and afterwards the 'Alert' ran up the affirmative pendant. They continued to stand on, and were just about to disappear behind a point of Disco Island, when, at 6.15 P.M. the 'Alert' hoisted a signal to the 'Discovery,' *Do you wish to communicate?* A few minutes afterwards the 'Alert' went about, apparently intending to beat up to windward and communicate with the 'Valorous'; and at 6.30 P.M. she hoisted a second signal to the 'Discovery'—*Optional, beat to windward.* Then a fog suddenly sank down on the water, and hid both ships from view. Supposing that they were beating up to her anchorage, the 'Valorous' went on blowing the steam fog-horn every ten minutes; but when the fog rose again towards morning, the 'Alert' and 'Discovery' were nowhere to be seen. When the fog came on, the intention of communicating must have been abandoned, and the Arctic ships must again have stood down the Waigat, and proceeded on their way to Upernivik. May all success and prosperity go with that gallant band of dauntless explorers!

(To be continued.)

* It is interesting to find the looms and razor-bills breeding together at this point (*Alca arra* and *Alca torda*). Further north the latter are not met with. A young cormorant (*Phalacrocorax carbo*) was also obtained, with a curious malformation (one of its wings being wanting), and several eggs of the cormorant; besides numerous eggs of looms, dovekeys and razor-bills.

II.

THE CRUISE OF THE 'VALOROUS.'

IN selecting a vessel for the duty of filling up the Arctic Expedition with coals and provisions at Godhavn, a strange choice was made. The 'Valorous,' an old paddle-wheel steamer of 1200 tons, was commissioned by Captain Loftus Jones at Devonport, in February 1875; with a very young ship's company, having an unusually large proportion of boys and ordinary seamen. Although a paddle-wheel steamer must inevitably loose her paddles in pack ice, and is quite unsuitable for service in the Arctic Regions, the 'Valorous' was ordered to proceed up Davis Strait, where ice is sure to be met with, and to visit a narrow strait which is more encumbered with icebergs than any other part of the Greenland seas. She was also to perform a special duty, in addition to her chief work connected with the expedition. Her orders were, after taking leave of the Arctic ships, to fill up with coal in the Waigat Strait, and then to carry a series of deep-sea soundings and dredgings down Davis Strait and across the Atlantic. Her instructions were to take a few dredgings on a line from Disco to the latitude of Holsteinborg, and 8 deep-sea soundings between the latitudes of Holsteinborg and Cape Farewell, the 3rd and 8th with serial temperatures, the rest only with surface and bottom temperatures. Then twelve soundings were to be taken across the Atlantic, between 60° and 57° N. latitude, ending at 20° E. longitude, in the space between the line of soundings taken by Sir Leopold McClintock in the 'Bulldog' in 1860, to the north, and those on a great circle between Valentia and Newfoundland, taken by Captain Dayman in the 'Cyclops,' in 1857, to the south. The 1st, 3rd, 5th, 7th, 8th, 10th, and 11th were to be soundings with bottom and surface temperatures, and the 2nd, 4th,

6th, 9th, and 12th were to be with serial temperatures. Dredgings were also to be taken when practicable, and Mr. Gwyn Jeffreys, with Mr. Herbert Carpenter as his assistant, went out in the 'Valorous' to examine the results of the dredgings. The necessary apparatus for deep-sea sounding and dredging was supplied.

Sailing in company with the Arctic ships, the 'Valorous' parted company on the 11th of June, encountered the same severe weather, and again sighted the 'Alert,' on the 28th of June, the day on which the heavy eastern pack was first met with, drifting round Cape Farewell and up the Greenland coast. It became necessary for this paddle-wheel steamer to pass through the formidable drifting ice; and Captain Jones, by the exercise of great care, and himself conning the ship from aloft, succeeded in bringing her through the pack without serious injury to the paddles. He prudently kept away to the westward with a view to getting clear of the ice, but a strong ice blink, indicating the near proximity of the middle pack, was seen away to the westward on the afternoon of the 28th, and the 'Valorous' was in no small danger of having to encounter risks to which such a vessel ought not to be exposed. Captain Jones is a careful officer, and a thorough seaman. In going to the north, he kept outside the Torske (cod) banks, and well away from the dangerous coast of Greenland, with its many unsurveyed outlying reefs and islets, and, to avoid a rock near Disco the position of which is doubtful, he kept away close to the Whale Fish Islands, and arrived safely at Godhavn on Sunday evening the 4th of July.

The 'Valorous,' in going up, took 17 soundings between latitude 63° 45′ N. and Godhavn.

From the 4th to the 15th the officers and ship's company were actively engaged in filling up the 'Alert' and 'Discovery' with coals and provisions, and supplying the explorers with everything that forethought could suggest as likely to be useful. It was then necessary, as the 'Valorous' had become very crank after discharging all the stores, to get in ballast, and Captain Jones's intention was to remain at Godhavn after the expedition had sailed, and to get in the required quantity of ballast before proceeding to carry out the latter and less important part of his instructions. But Captain Nares expressed a wish that the 'Valorous' should accompany him as far as Ritenbenk, in order to enable him to finish his letters, a request to which Captain Jones of course readily acceded.

After accompanying the expedition to Ritenbenk, and receiving the mail-bags, the 'Valorous,' with Mr. Krarup Smith, the Inspector of North Greenland, on board as pilot, proceeded to Ritenbenk Kulbrud on the Disco shore of the Waigat Strait, on the 17th of July, anchoring off that exposed coast, in front of the coal cliffs, at 1 P.M. The cliffs are of shale and sandstone, with four horizontal seams of coal clearly visible from the ship. High above them there is a ridge of basaltic buttresses formed by the waterfalls pouring over their summits, and a steep green slope of spongy grass and mosses intervenes between the foot of the basalt precipice and the top of the coal cliffs.

The 'Pandora' was expected to arrive at Disco about the 20th of July, and Captain Allen Young had requested that, if possible, an arrangement might be made for having a supply of coal ready for him on his arrival. Mr. Krarup Smith, on being applied to, very obligingly took prompt measures to ensure compliance with the request; and when the 'Valorous' arrived at the Ritenbenk Kulbrud, a party of Eskimo, with an old Danish overseer, had already been at work since Monday the 12th of July, digging out coal. Two tents were pitched on the cliff, a gang of rather pretty girls was digging away at one of the upper seams, and the men were fishing in kayaks, while another tent was pitched on the beach near the two large *umiaks* in which the women, tents, and provisions had come from a place on the Disco shore called Ujarasussuk. The Eskimos were clearing away the overlying shale, so as to lay bare a large surface of coal about two-thirds of the way up the cliff. Mr. Krarup Smith inspected the work, and, before taking leave and returning in his boat to the settlement of Ritenbenk, he said that 40 tons of coal would be ready for Captain Allen Young, as soon as the 'Pandora' arrived. We may, therefore, hope that the 'Pandora' will successfully reach the North Water of Baffin's Bay, visit the Cary Islands and Point Gale or Cape Isabella, and bring back welcome letters and the latest news of the Arctic Expedition in the autumn.

The lowest seam of coal, close to the beach, appeared to be the best, and here the working parties from the 'Valorous' commenced operations. It is a light coal containing bitumen, and it was found that 1 lb. of it boiled a gallon of water in 25 minutes, which English coal did in 18 minutes.

The strait between the island of Disco and the Noursoak Peninsula on the mainland of Greenland, is 80 miles long from Arve Prins Island to Hare Island at its outlet in Baffin's Bay, and 10 miles wide. At the north corner of Arve Prins Island there is a deep fjord separating it from the Noursoak Peninsula, with the great discharging glacier of Tossukatek at its upper end. The glacier sends forth a constant stream of huge icebergs down the strait which the Dutch well-named the "Waigat" or blow-hole. The Danes call it "Waigattet," and the Eskimo "Ikareseksoak." A current generally flows down the Waigat into Baffin's Bay, which carries with it the whole of the icebergs from the Tossukatek glacier, and many from that of Jacobshavn; but the drift of the bergs is also influenced by the winds, which blow up or down the strait. The S.E. wind drives the icebergs over to the Greenland shore, while those from the N.W. bring them across to the Disco side. Dark mountains rise up on either hand. Those of Disco average a height of 3000 feet, while on the Greenland side the Noursoak Mountains are loftier, with mighty precipices, and serrated ridges and peaks.

It would be difficult to conceive a more precarious anchorage than that off the open coast of this iceberg-laden Waigat. The best position that presented itself had been selected in front of the coal cliffs, which are in 70° 3′ 24″ N. latitude, and about half way down the strait. At each end of the cliff, which extends for about 2 miles, there is a wide swampy delta formed by the drainage of the inland glaciers, off which shoals have formed. These shoals afforded some slight protection to the 'Valorous,' for the icebergs grounded on them, and remained aground until the heat and sea reduced their bulk and set them afloat again. Several bergs of enormous size were

thus aground, and in threatening proximity to the ship.

When the 'Valorous' arrived the mass of icebergs was on the Greenland side, the wind being from the south-east, but it was evident that a wind might spring up from the opposite direction at any moment, when the ice would come over, and the ship would be in a hazardous position, particularly if the weather was foggy. On Sunday, the 18th, Captain Jones sent the cutter across the Waigat with the Navigating Lieutenant, Mr. Broad, to ascertain whether there was safe anchorage at Atanekerdluk; the locality famous for the fossil miocene plants that have been found there by Dr. Walker, Dr. Brown, Professor Nordenskiold, and others, and described by Professor Heer. It took five hours to beat across the strait, against a dead foul wind, amidst hundreds of icebergs and drifting berg pieces.

Atanekerdluk Harbour is formed by a mass of coarse-grained dolerite about a mile long, which is connected with the mainland of the Noursoak Peninsula by an isthmus of sand, forming a bay on either side, the northern bay being further protected by a basalt rock joined to the main by another spit of sand. The water in the north bay is very deep, and the entrance was blocked up with icebergs. The south bay, facing the stream of bergs, was entirely filled with ice. The mountains above Atanekerdluk rise abruptly to a height of 4000 feet, ending in sharp peaks, and the strata containing fossil plants consist of ferruginous clay 1200 feet above the sea. The deep gorges lower down show the geological section described by Brown and Nordenskiold, shales with thin sand-beds and coal-seams belonging to the upper cretaceous period. The whole is crossed by vast dykes of eruptive rock, which are weathered out into distinct walls on either side of the ravines, about 10 feet broad. One basaltic pillar, called "Rink's Obelisk," stands on the face of the mountain, just over the harbour. Above, where the fossils are chiefly found, the formation is of the miocene period.

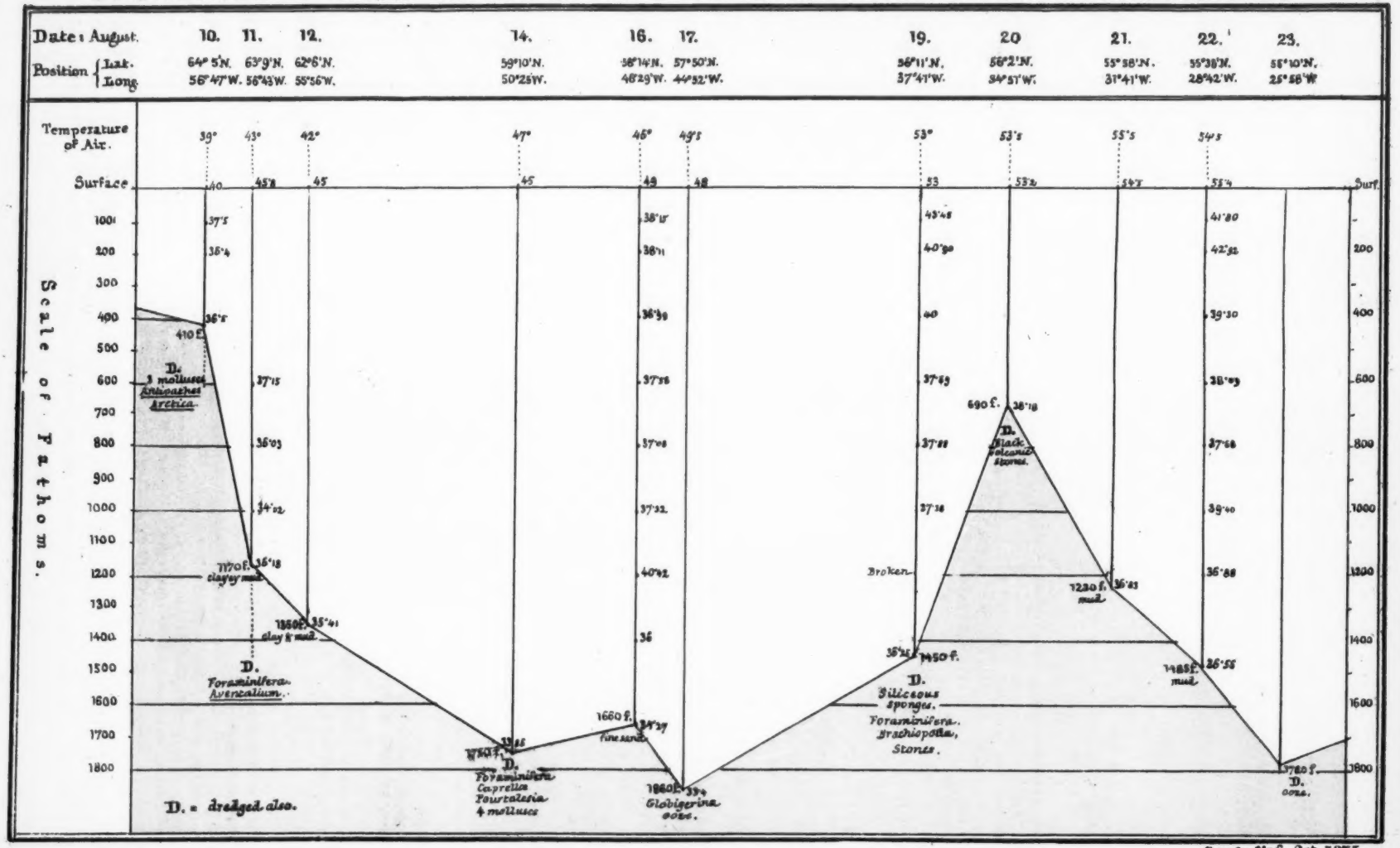
At 6 P.M. it came on to blow hard with rain, and threatening dark clouds were banking up across the Disco Mountains. The scene was indescribably grand and wild. An army of icebergs was drifting down the Waigat, and occasionally calving or turning over with a loud echoing noise. Some of them were of great height, with their pinnacles and summits, 300 feet high, peering up through the wild scud and mist. Now and then a gleam of sunlight brought out a peak of Disco range in bright relief. The wind carried the boat swiftly out of the harbour, with only the oars squared. Then a close-reefed foresail was hoisted, and she scudded before the squalls at a brave pace, breasting and dashing through the waves, while the white spray curled round her and flew from her bows. The spray also dashed wildly over the icebergs which were drifting down the Waigat, rising and falling on the waves, and occasionally coming into collision with a loud roar. It was no easy work to steer clear of them, so thickly were they crowded together, and once a shift of wind in a squall took the sail aback. It was a wild and dangerous passage, and the boat did not reach the 'Valorous' until near midnight. Neither Atanekerdluk nor any part of the Waigat are fit places for a paddle-wheel steamer.

In calm weather the scenery of the Waigat is, however, very lovely. Icebergs rest quietly on the glassy surface of the sea, and the sharp serrated outline of the Noursoak Range stands out in clear relief against a bright golden sky, while the grand precipices of Disco have a ruddy reflection on them from the midnight sun. There is certainly no better place for studying the formation and movements of the icebergs, which can be seen drifting in hundreds out of the glacier discharging fjord, and floating in imposing masses down the strait, grounding and again afloat, calving with loud discharges, and breaking up with a noise like thunder. On one, with lofty peaks and much snow, a thin reddish band was observed running diagonally across and passing through the berg—being on both sides. These discolourations in bands are not uncommon. They must be layers deposited on the surface glacier by dirty running water, and, when seen on a berg, they show the angle at which it has fallen over. Again a line of clear sapphire blue is frequently seen to cross the white mass of an iceberg, which also passes through it and appears on the other side. When the berg breaks up, this transparent blue ice separates from the white opaque mass, and the two kinds may be seen floating on the sea, and washed up on the beach. When the berg was a portion of the mother glacier, a rivulet must have spread over the surface at one time and been frozen, forming the hard transparent layer of blue ice, afterwards snow has fallen and been compressed above it, and thus a blue line or a brown line, according as the rivulet was clean or dirty, is formed, which appears in the iceberg when it becomes detached. Off the Ritenbenk coal cliffs there is an incessant rumbling noise through the night, a combination of the roar of many waterfalls pouring over the basalt summits, of others dashing down the cliffs, of the grinding of ice on the beach, and of the calving of bergs in the offing.

At one part of the cliffs a dyke of white basalt has cut through the strata to the beach, and at the south-eastern end there is a mass of ferruginous clay, which contains many impressions of fossil plants of the upper cretaceous period. Beyond the cliffs is the delta two miles across, formed by the drainage of the interior glacier, which here breaks through the basaltic ridge and, in the course of ages, has entirely worn down the cliffs, grinding the sand to powder and scattering the coal over the plain and adjacent sea. The delta is traversed by numerous streams flowing from the glacier, and winding amongst great tufts of turf and boggy earth, covered with *equisetum* and dwarf willow. The delta presents a concave outline to the sea, formed of a ridge of sandy beach with a narrow backwater having tidal outlets between it and the swampy plain. The shores of the Waigat consist of cliffs alternating with these swampy deltas, and are quite different from the outline laid down on the chart.

The ship had been in constant danger from the bergs, and on Wednesday the 21st of July, a larger mass of ice than usual drifted down and made it necessary to get under weigh. The wind was shifting to the north, and the anchorage was no longer safe. During five days the men had worked admirably at the coal-seams, and, in 88 hours, they got on board no less than 105 tons. In the evening of the 21st the 'Valorous' steamed down the Waigat, and was off Hare Island, at the north end of Disco, the next

SOUNDINGS OF H.M.S. VALOROUS IN DAVIS STR. & THE ATLANTIC OCEAN. 1875.



Geogr. Mag. Oct. 1875.

morning. She was not an hour too soon, for the wind had shifted round to the north with fog, which would have brought all the ice over to the Disco side of the Waigat, and the ship would have stood a good chance of being driven on shore.

The second and supplementary part of the work imposed upon the 'Valorous' now commenced, namely the dredging and sounding between Disco and the latitude of Holsteinborg. But it was also necessary to complete the work of getting in the ballast which had been broken off at Godhavn, and Captain Jones decided upon putting into Holsteinborg for that purpose. Godhavn would now be considerably out of the way, while Holsteinborg is clear of the east ice drifting from the south, and at the same time conveniently situated for commencing the deep-sea soundings on the parallel of 67° N., in accordance with the instructions.

The first deep-sea sounding and dredging in Baffin's Bay was attempted by Sir John Ross in 1818. He invented what he called a deep-sea clamm, consisting of a pair of forceps kept asunder by a bolt, and so contrived that, on the bolt touching ground, a weight slipped down a spindle and closed the forceps, which retained samples of the bottom. On September 1st, 1818, in 73° 37′ N. and 75° 25′ W., he sounded in 1000 fathoms and obtained a beautiful *Caput Medusæ* (*Asterophyton*) entangled on the line, the first animal that was ever brought up from such a depth. It is a very curious star-fish with long branching tentacles. In July 1871 the Swedish steamer 'Ingegra,' which brought home the meteoric stones found by Nordenskiold at Ovifak, took soundings with surface and bottom temperatures off Upernivik and Svarte Huk, two off Disco, and 11 off the coast from Rifkoll to Cape Amalia, twenty altogether, but no deep-sea dredgings.

The first dredging of the 'Valorous' was a few miles north of Hare Island, at the mouth of the Waigat, in latitude 70° 35′ N. But Mr. Gwyn Jeffreys had already dredged both in and outside the harbour of Godhavn, obtaining a good collection of the mollusca, crustacea, and other organisms; as well as off the Ritenbenk Kulbrud, with the interesting result that the bottom of the Waigat, though covered with glacial mud, is found to be rich in animal life. The arrangements for dredging on board the 'Valorous' were similar to those in the 'Challenger,' except that the work was done from the fore instead of the main-yard-arm. In sounding it is necessary to shorten and furl sails and have the ship under steam to keep her over the line. An iron pulley is placed on the fore-yard outside the boom iron, and a 4-inch hawser is rove through it to trice up the accumulator, which consists of 20 pairs of India-rubber bands ¾ of an inch in diameter, 3 feet long, and stretching to 17 feet, when they exert a pressure of 70 lbs. This arrangement takes off all strains on the dredge-rope, which might otherwise cause it to part. The bands are kept separate by being rove through holes in a circular disc of wood; at the bottom of which there is a 9-inch block with a patent sheave, and through it the dredge-rope runs. The dredge-rope, 2½-inch of the best Italian hemp, is coiled away in a rack or "sheep pen," abaft the mizenmast, and is marked as a sounding-line. It passes through the block at the end of the accumulator, and is then made fast to the dredge, the other end being brought to the donkey-engine for heaving in. The dredge is an iron framework with arms connected together by iron screw-bolts, and between them there is an iron tongue with a swivel to which the rope is attached. On each of the long sides of the iron framework there is a broad piece of knife-edged iron, at an angle of about 10° from the perpendicular, to skim the surface off the bottom and throw it into the sack, which is made of net-work of soft line in very small meshes, and secured to the framework by lacing. The sack was covered with hides in which holes were pierced, to prevent it from being cut by rocks. An iron bar was secured to the lower end of the framework, to which a line of swabs was fastened, to entangle any animals missed by the dredge.

At 1 P.M. of July 22nd the dredge went down in 175 fathoms, and was brought up by the donkey-engine. It contained many organisms in very tenacious mud, and several splendid specimens of the *Asterophyton* (*Caput Medusæ* of Sir John Ross) were adhering to the swabs. There was a second dredging at 4 P.M. On the 23rd two dredgings were taken in the afternoon, with equally valuable results. But it was found that the long tentacles of the *Asterophytons* and other echinoderms got inextricably entangled in the thick swabs; so Captain Jones had some yarns of duck carefully frayed out and secured in a row to the bar below the dredge, which answered much better. On Saturday the 24th the 'Valorous' was in sight of Rifkoll, and over the Torske Bank, where there were 20 and 16 fathoms. Two very rich hauls of the dredge were taken in the afternoon, which brought up many echinoderms, including a great number of *Holothuria* and crustacea, among which was the curious *Caprella* or naked shrimp, and a good supply of molluscs of Arctic forms. Another dredging was taken on the 26th, in 60 fathoms.

On Sunday the 25th the ship was near the Knight Islands, a long reef placed on the chart just to the north of Holsteinborg; but the weather was foggy, and Captain Jones prudently stood out to sea, waiting for the mists to clear away. The 26th was also foggy, and the 'Valorous' continued to stand off the land, being about 40 miles from Holsteinborg, and to the southward at midnight.

The fog cleared away in the morning of Tuesday the 27th of July, and the 'Valorous' shaped a course to Holsteinborg, the current setting her rapidly to the north until, at 7 A.M., she sighted the outermost of the Knight Islands. According to the general chart the harbour of Holsteinborg is approached by an east course a mile or two to the south of these islands. There is also a special plan of the harbour, which was surveyed by Mr. Stanton, the master of the 'Phœnix,' in 1854; but it only shows the inner anchorage, and affords no information respecting the approaches. Captain Jones, after getting well clear of and 3 miles to the south of the Knight Islands, the only danger indicated on the chart, found himself 10 miles outside Holsteinborg and, so far as the chart or sailing directions informed him, in the fair way for the harbour. Feeling his way carefully in, he shortened sail, and, shaping a course nearly east, proceeded under steam at a rate of 4 knots. This speed was necessary to keep the ship under command, as there was a strong tide flowing to the northward, and setting against the ship's starboard bow. Ahead, at a distance of 5 miles,

there was a round island which was taken to be one shown on the plan with a beacon on it. Although several miles from the port, Captain Jones was on the point of stopping the engines, and sending a boat in for a pilot, when the ship struck on a sunken rock, at 9.15 A.M. At the time there were two leadsmen on each paddle-box, with leads constantly going, and a minute before the port leadsmen had got 17 fathoms. Most providentially the tide was rising, but the wind was freshening, and for the next hour the ship continued to bump heavily on the rocks, both ahead and under the engine-room on the starboard side. Captain Jones wisely determined not to back the engines but to wait for the tide to rise, and in the meanwhile the paddle-box boats were got out, anchors were laid out, and all necessary precautions were taken. If a gale had come on the danger would have been very great, but otherwise there was good hope that the ship would float at flood tide.

The cutter was sent away at 10.30 A.M., in charge of Lieutenant Wood, to ascertain the position of Holsteinborg, get a pilot, and give notice of the accident. There was a chop of a sea with a fresh breeze, and heavy fog hanging over the Greenland Mountains, though the Knight Islands were in sight to the north, and the round island, for which the cutter steered, was visible 5 miles to the east. On coming closer no beacon was to be seen, and it became a puzzle to know how to proceed, for the charts were evidently wrong and misleading. Hawling closer to the wind, to look round another island further north, three kayaks came in sight, containing Eskimos belonging to a party encamped on one of the islands (that called Marryatt Island in the plan, the proper name of which is Iglutalik) to fish for halibut. One named Gideon was at once sent off to the 'Valorous' as a pilot, while red-haired grinning Isak, and another guided the cutter through a labyrinth of islets and rocks to the settlement. It turned out that the round island was not on the plan or chart, while it intercepted the view of the island on which the beacon is placed according to the plan, called Fredrick VII. Isle, but the real name of which is Amertlok. There is no beacon, but only a flag-staff. Holsteinborg consists of five very neat wooden houses, a store, a church, and a dozen Eskimo habitations: the houses painted black or white with red roofs, the huts of stone with glass windows and wooden gable-roofs. The church dates from 1773, and the clergyman's house is a few years older. The population of the settlement, the native name of which is Sisimiut, is 201; and of the whole colony of Holsteinborg, including Sisimiut and eight other stations, 565. Holsteinborg stands on a patch of bright green turf surrounded by sombre masses of granite with a background of magnificent precipitous mountains, ending in a sharp peak called *Nususak* or "the top-knot," in Eskimo; and in Danish *Kærling-hetten*. It is improperly named Mount Cunningham on the Admiralty plan. The settlement is approached from the harbour by a little creek, with perpendicular gneiss rock on one side, and on the other an inner cove containing a schooner-rigged boat and several whale-boats. The harbour is very deep and protected by outlying islets, and opposite Holsteinborg fine masses of gneiss, with bright patches of green in the ravines, rise to a height of 2000 feet. It was here that the Holsteinborg settlement was originally formed, and the lofty peak above the old site is called the *Præste Fjeld* from the famous priest and naturalist Fabricius, having climbed its almost perpendicular sides, and built a cairn on its summit.

Mr. Lassen, the Governor of Holsteinborg, with Johan Leonard, the pilot, at once came out in the cutter. Fortunately the wind had died away and the ship had floated off soon after noon. But she was making much water, and there was a serious leak near the fore-foot. She was piloted round to the south of all the unknown dangers, and safely anchored off the settlement of Holsteinborg at 7.10 P.M.

Mr. Lassen said that, owing to reefs and sunken rocks, not indicated on the chart, Holsteinborg could only be approached from the south. It so happens that ships always have come from the south, the 'Victory,' with Sir John Ross, in 1829, the 'Phœnix' and 'Breadalbane' in 1853, the 'Fox' in 1858, the 'Juniata' in 1873, and the annual ships from Denmark. But it appears that, between 1850 and 1860, a Scotch fishing schooner, approaching from the west, struck on this very reef. Mr. Lassen reported that, to the westward, there are three reefs at a distance of 9, 12, and 14 miles from the harbour, on the innermost of which the 'Valorous' struck; while further to the south, and 14 miles from the harbour, there are other rocks not visible above water. None of these dangers are indicated either on the plan or chart. On the 28th and 29th Captain Jones and Mr. Broad were occupied in making a survey of the approaches to the harbour. It was found that the Knight Islands, instead of running out from the land in an east and west line, as shown on the general chart, trend at a sharp angle to the south-west, that other islands were out of their places, and that several islands and rocks were not shown; while no warning of danger is either given in the sailing directions, or indicated on the plan. Practically it was a very dangerous and unsurveyed coast, and without reliable charts, no precautions can remove all risk in approaching it. Certainly the Captain of the 'Valorous,' throughout the voyage, was most careful and watchful in the performance of the difficult and hazardous service that had been entrusted to him.

At first the water made at the rate of 8 inches an hour, and the pumps were kept constantly going. The divers reported that several feet of the main keel and the lower part of the gripe were torn away or split, and that the garboard strakes on both sides were started. When the ship was docked, it was found that her injuries were even more serious, but it was also found that the divers had made a very good job of the temporary repairs. A strong bulkhead, as a coffer dam, was built at a distance of 12 feet from the stem, and 9 feet high and wide, fitting to the flooring, orlop deck, and sides, and forming a nearly watertight compartment to confine the main leak. The keel was drawn together by a clamp, and the garboards by 17 bolts driven through them, and into the dead wood, the whole being covered with lead sheeting and copper, which made all safe for crossing the Atlantic. A mizen trysail was thrummed, in case it should be required. The ship's company, composed mainly of mere lads, both at the coal-seam and at the weary pumps, worked well and cheerfully, and when the ship was on shore they showed energy, promptitude, and presence of mind. If ever men earned special reward for ex-

ceptional service, the young ship's company of the 'Valorous' have so earned, and well deserve the recognition they have since received.

The Holsteinborg region presents much that is interesting, especially as regards the difference between its flora and fauna, and those of the more northern parts of Greenland. The vegetation is richer, and flowers, such as *epilobium*, grow in great profusion, while bunches of sorrel and angelica are brought off for sale. The Knight Islands literally swarm with razor-bills, which take the place occupied by the looms in the far north. The plumage of the two species (*Alca arra* and *Alca torda*) is the same, and the only difference is in the bills, one razor-shaped, the other short and pointed. indicating the difference of food as the cause for the northern and southern habitats of the two birds. The razor-bill appears to live chiefly on the sea eggs (*Toxopneustes Dröbachiensis*), bits of the broken shells of which are scattered over the rocks. Glaucous gulls and kittiwakes breed on the Knight Islands. The handsome red-breasted merganser (*Mergus serrator*), and the harlequin duck (*Histrionicus torquatus*) are also birds common round Holsteinborg, which are not met with north of Disco. Eider and king ducks are abundant. There is a great fishery of rock cod, salmon, trout and huge halibut on the banks outside, and trout abound in the small lakes and streams. Edible scollops are procured from the rocks (*Pecten islandicas*), and among the crustacea were found the very curious little creatures which swim about on their backs in small ponds on the islands (*Apus glacialis* and *Branchipus paludosus*), and are well described by Fabricius. The former resembles the trilobite of Silurian times. They form the common food of ducks and divers. Mr. Gwyn Jeffreys and Mr. Carpenter were enabled to obtain four interesting dredgings, with the use of the Governor's boat, in 10 and in 30 fathoms.

On August 8th, the divers having completed their labours, the 'Valorous' sailed from Holsteinborg, and recrossed the Arctic Circle at midnight. Although, in her injured condition, it was necessary to return to England with as little delay as possible, Captain Loftus Jones was determined to do his utmost to carry out his instructions; and he succeeded in taking a most important line of soundings down Davis Strait and across the Atlantic, over previously untouched ground.

The four following soundings were taken down the centre of Davis Strait:—

August 10th. Lat. 64° 5′ N. Long. 56° 47′ W.	410 fathoms— Surface temperature 41° Bottom ,, 36° The dredge brought up three molluscs (one a brachiopod) belonging to the Norwegian seas, but not previously known as Greenland species; also *Antipathes artica*.
August 11th. Lat. 63° 9′ N. Long. 56° 43′ W.	1170 fathoms— Surface temperature 42° Bottom ,, 36°.18 The dredge brought up a *dentalium*, and many foraminifera.
August 12th. Lat. 62° 6′ N. Long. 55° 56′ W.	1350 fathoms— Surface temperature 45° Bottom ,, 35°.4
August 14th. Lat. 59° 10′ N. Long. 50° 25′ W.	1750 fathoms— Surface temperature 45° Bottom ,, 33°.8 The dredge brought up two minute crustaceans new to science, caprellæ, and a minute bivalve, besides other molluscs, siliceous sponge spicules, globigerinæ, and a rare crustacean (*Pourtalesia*)

The Atlantic soundings go over an unexplored area between the lines of the 'Bulldog' and 'Cyclops.' They are seven in number, as follows:—

August 16th. Lat. 58° 14′ N. Long. 46° 29′ W.	1660 fathoms— Surface temperature 49° Bottom ,, 34°.27 Serial temperatures were also taken at every 200 fathoms.
August 17th. Lat. 57° 50′ N. Long. 44° 52′ W.	1860 fathoms— Surface temperature 53° Bottom ,, 33°.4 The dredge brought up globigerina ooze.
August 19th. Lat. 56° 11′ N. Long. 37° 41′ W.	1450 fathoms— Surface temperature 53° Bottom ,, 36°.2 Stony bottom. The dredge brought up stones, exquisite siliceous sponges, a brachiopod, and foraminifera.
August 20th. Lat. 56° 2′ N. Long. 34° 51′ W.	690 fathoms— Surface temperature 53°.5 Bottom ,, 38°.2 Black volcanic stones, Echinoderms, siliceous sponges, annelids.
August 21st. Lat. 55° 58′ N. Long. 31° 41′ W.	1220 fathoms— Surface temperature 55°.5 Bottom ,, 36°.76 Mud.
August 22nd. Lat. 55° 38′ N. Long. 28° 42′ W.	1485 fathoms— Surface temperature 54°.5 Bottom ,, 36°.56 Mud.
August 23rd. Lat. 55° 10′ N. Long. 25° 58′ W.	1785 fathoms—

A gale of wind, with a very heavy sea, came on on the 24th, and continued during the two following days, which put an end to further sounding, as by the 26th the 'Valorous' had reached known ground off the west coast of Ireland.

Besides performing her chief duty connected with the Arctic Expedition, the 'Valorous' has undoubtedly done much useful work during her cruise of three months to Greenland. The positions of several places in the Waigat, incorrectly placed on the Admiralty chart, have been accurately fixed. Holsteinborg has been surveyed and the dangers in approaching it have been laid down. No less than 57 soundings have been taken in Davis Strait and the Atlantic; and dredgings, which have yielded very important results, have been brought up within and outside Godhavn, in the Waigat, off Hare Island, on a line down the centre of Davis Strait, and in a previously unexamined part of the Atlantic. Several new forms have been discovered, but the most interesting results have reference to questions of geographical distribution of the Greenland and Norwegian marine faunas. The Atlantic soundings show that there is a "cap" or ridge, with only 690 fathoms on it and comparatively steep sides, at a distance of about 400 miles S.E. of

Cape Farewell, in 56° N. and 34° 51 W. Basaltic and other volcanic stones were brought up, and it is remarkable that these stones are sharp and angular, and not water worn, as would have been the case if they had been conveyed any considerable distance by a current.

The 'Valorous' arrived at Devonport, after an absence of three months, on the 29th of August. Her officers and ship's company have done good service, and have most cheerfully and zealously faced dangers, borne hardships and discomforts, and performed much heavy additional work of a novel character. Their services deserved some recognition, whilst those of their gallant captain, to whose energy, prudence, and high seamanlike qualities the success of the voyage is due, are sufficiently indicated by the above succinct statement of the work that has been achieved. Captain Loftus Jones has been exonerated from all blame by the Lords of the Admiralty, for the grounding of the ship off Holsteinborg; and the able and judicious way in which he carried out his instructions has been fully approved. The officers and ship's company of the 'Valorous,' in recognition of the arduous character of the service, have been granted double pay from the day the ship left Spithead to the day of her return to Devonport. The results of the cruise of the 'Valorous' are a collateral benefit derived from the despatch of an Arctic Expedition, and should be looked upon and rewarded as the first-fruits of that great national enterprise.

THE ATTREK BED OF THE OXUS.

THE discovery of an ancient bed of the Oxus, passing through the gap in the Kurrendagh Hills, south of Kizyl Arvat, to enter the Caspian by the course of the Attrek, seems to throw light on a passage of Strabo, which has hitherto been somewhat obscure. In Book XI., cap. 7 of this author, it is said that Hyrcania has the advantage of being entirely traversed by the lower courses of the rivers Oxus and Ochus; and though the information given is scanty, it suggests that some portion, at least, of the Oxus waters took the direction indicated by Sir H. Rawlinson, during the recent meeting of the British Association at Bristol.

About the Christian era, geographers were uncertain whether Ochus was or was not, a separate stream from Oxus. Some who were of the first opinion stated the course of Ochus to be more to the south than that of Oxus, while others affirmed that the two rivers first ran separately, and afterwards united their waters, which then flowed down to an outlet in the Caspian Sea. The grounds for this belief have now been explained by the discovery of the Oxus-Attrek bed, for the latter river* may be safely identified with Ochus, described by Apollodorus, as being the nearest river to the Parthians.

The conflicting opinions which were current in Strabo's day, regarding the lower courses of the two rivers in question, suggest a doubt as to whether the principal and continuous stream of the Oxus flowed by the recently discovered bed, and seem rather to indicate that Ochus received such an intermittent supply, as an irrigation canal derived from Oxus, would have carried. It is to be remarked besides that the slope of the Oxus-Ochus course is flatter than that possessed by the ancient bed, which has been observed by Russian officers to run from the east to Igdy Wells, where it unites with the old Uzboy Channel, whose mouth is in Balkân Bay. Such a direct east and west course for the Oxus from Chardjui, would also far better respond to the concise statement of Herodotus, who described one arm of the Araxes to have a *clear* course to the Caspian, than the indirect Oxus-Ochus course. It is true that this old bed, from Chardjui to an outlet in the Caspian, has not yet been established as being in existence throughout the whole distance; but ancient local tradition as well as the reports of Turkomans, leave little room for doubting that it actually does exist.

The Arabian writer Mokaddassî (10th century), an extract from whom has been recently published by Professor M. J. de Goeje, speaks of the old direction in which the Oxus flowed, and relates the fact of the river having taken a new direction. The passage about to be quoted occurs on p. 13 of the Professor's pamphlet, *Das alte bette des Oxus* (Leiden, 1875). "When the King banished them (the malcontents) to Khwarizm, he diverted a canal from the Oxus in their direction, in order that they might cultivate the soil. The main stream at that time ran to a town beyond Nesâ, called Balkân, whose prince went to visit that (banished) population and found it to be composed of very capable people. He was the host of their chief, and gambled with him, and it was the Khwarizmian who won. It had been agreed that the winner should have the right of opening the canal from the Jyhoon for a day and a night, and the Prince of Balkân kept his word. But when the water was allowed to flow freely, the stream ran with such force and rapidity, that it was unable to be stopped, and in this way the river took the new direction, which it has to-day." In this passage it will be noted that the *main* stream flowed to Balkân, but this fact would not of course prevent a canal being led from the Oxus past Nesâ* (and ....Kizyl-arvat) through the gap in the Kurrendagh Hills, to a junction with the course of the Attrek.

The above curious and important passage, extracted from a MS. of Mokaddassî, obtained by Professor de Goeje from Constantinople, affords a good illustration of a paper (read at the recent British Association meeting and) which attributed the changes which have taken place in the course of the Oxus, to the very ancient practice of irrigation from its waters. The change, described in the tradition recorded by Mokaddassî, of the flow of the river from its outlet at Balkân, would have deprived the Oxus-Ochus course of its waters, just as (perhaps), some twelve or fourteen centuries subsequently, the last change of the Amú Darya from its Caspian outlet, to which it flowed by Uzboy into Lake Aral by the present course, turned (as Abu-'l Ghâzy Khan tells us) the environs of Kunya Urgenj and the whole country to the south-west of that place into a desert.

Professor Rawlinson said at Bristol that if a vast tract of what was now sandy wilderness (on the east of the Caspian) was in ancient times a well irrigated and fertile region, much light would be thrown on early Parthian history. The *if* here used seems if anything to possess an excess of the virtue of caution; for it seems difficult to avoid the con-

* The Ochus is more probably the Tejend.—ED.

* Nias-tepe?—ED.

KNIGHT ISLANDS.

Innusutinguah I.

Krasit I$^{s.}$

awash

awash

awash

dries 10 feet

dries 2 feet

Krasit-siurartlak I$^{s.}$

awash

H.W.F & C. VII^{h} Sp. rise 12 f^{t}

Magnetic

Track of H. M. S. "Valorous" before Grounding

Kranisutinguak Reef

bearing about there.

Track of H. M. S. 'Valorous' into Holsteinborg after

0 ½ 1 2 4

Plan of the HARBOUR OF HOLSTEINBORG

(GREENLAND),

And of its outlying Islands and Reefs,

Surveyed after the grounding of

H.M.S. VALOROUS,

BY

NAVIGATING LIEUTENANT GEORGE A. BROAD, R.N.

Flag Staff (above the Governor's house) } 66° 54′ 31″ N. 53° 40′ 0″ W.

Var. 66° W. Rise and fall 10 feet.

Names from Captain Inglefield's Plan (1854) in brackets.

Numerous Islets and Reefs about here

Innusutinguah I.

awash

awash

dries 10 feet

N

E

S

W

Magnetic

reef

awash

awash

Anguarfik I.

Iglutalik I
(Marryat I.)

awash

awash

awash

Main Land

Præste Fjeld (Bellot Ra.)

dries 12 ft

First site of Holsteinborg

Walrus Point

Asûmiut (Hamilton I.)

Artlaravik

Serlarûat (Snyd I.)

Kangerdluarsuk

Kremelivinguak

(White I.)

Krekertanguak

Small Lakes

Beacon

Amertlok
(Frederick VII. I.)

Iwilinguak
(Elliott I.)

Fs.

Holsteinborg or Sisimiut

Boiling Ho.

Beacon

Kærling-hetten Peak or Nusuoak

Tiserkratinguak
(Hummock I.)

Amertusak

(Moller I.)

(Stone I.)

(Bellasis I.)

(Fawckner Pt.)

Track of H.M.S. 'Valorous' into Holsteinborg after grounding

2 4 6 Miles.

Jacob Rk dries 12 ft

clusion that the greater portion of the vast sterile wilds lying to the west of the great Central Asian *plateau*, have been actually made into sandy deserts by the practice of irrigation from the Oxus. Year after year, from the remotest antiquity, in some one or other of these latitudes, the sand deposited by the intercepted waters of the river has been excavated from the canals to be placed upon their banks, from whence it has again been distributed by the wind, over the whole country.

Thus the Chorasmia itself of early history may be, so to speak, but a palimpsest, which was written on the surface of Western Asia, over earlier and effaced civilizations. Of these no trace remains, unless a speculation may be hazarded that one such civilization was swept away by the Massagetes, living on the banks of those northern arms of the Araxes, which were not improbably irrigation canals, derived from the Oxus by an Aryan race of a previous epoch. Nor need this train of speculation be regarded as entirely unprofitable, for it leads to a forecast of changes which may be wrought upon the face of Nature, in regions where the two extremes of European culture and development are not unlikely one day to confront one another. HERBERT WOOD.

A SKETCH OF MONGOLIA AND THE COUNTRY OF THE TANGUTANS.

MONGOLIA is a vast country extending from the Khingan Mountains (separating it from Manchuria) on the east to the Tian Shan and Pamir on the west, and from Siberia on the north to China Proper on the south.

In its western part it has been very little explored, and if we except Mr. Ney Elias's route, in 1871, from Kwei-hwa-cheng to Uliassutai and some recent Russian travels in its north-west, it is almost unknown. In its centre lie the great trade-routes between Russia and China; here as well as on the east it has been mapped and surveyed by scientific explorers. The travels of Colonel Prejevalsky give a graphic description of this country, and supply a great deal of interesting information which the limits of this sketch will only allow of my briefly mentioning, but which will be found in detail in an English edition soon to be published.

A strip of fertile country extends along the north of Mongolia to about the meridian of Urga. Here the scenery is very like that of Eastern Siberia, although the forests are not so dense or the trees so fine as those which grow on the banks of the Amur. It is watered by some tributaries of the great northern rivers, but the pasturage is rich and abundant, the slopes of the hills and the valleys are well clothed with grass, and animal life is still plentiful. Not until he leaves Urga need the traveller prepare himself for the terrors of the great desert of the Gobi, or as the Mongols call it *Shamo*, which extends across the greater part of the continent. Here he will cross miles and miles of perfectly bare level sand, the only relief to the eye being a few stunted bushes and tufts of saline grass, the only living creatures steppe antelope, the little *Lagomys ogotono* allied to the hare tribe, larks, sand-grouse, and a few birds and beasts of prey. Now and again a long train of tea-laden two-humped Mongolian camels pass along on their way to Kiakhta, or an encampment of Mongols stands by the roadside. With these exceptions there is nothing to break the monotony of the long and tedious journey.

The inhabitants of Northern Mongolia are the Kalkas, a nomad pastoral people, whose chief wealth consists in their flocks and herds, and whose only occupation is roaming from place to place in search of pasturage for them. They pay no tribute to China, but are liable to military service, and are divided into *banners* or districts under the control of mandarins of high rank; for local purposes they are governed by their hereditary princes, who claim descent from Jinghiz Khan. The Kalkas are types of the pure Mongol race, the characteristics of which are shown in their high cheek-bones, round flat faces, scanty hair, absence of beard or whiskers, oblique eyes, low foreheads, square thickset figures, and moderate stature. They are ardently attached to their nomad life, cheerfully enduring the extremes of cold and heat or whatever hardships may befall them. Their habitation is the yurta or felt tent, characteristic of the whole of Central Asia, which is easily taken to pieces and removed on the backs of camels. The horse is their favourite domestic animal, and they ride on every occasion, the shortest distances never being performed on foot if they can possibly avoid it. Horse-racing is quite as popular a pastime among them as among their western *confrères*, and the Mongol "Derby" is run at Urga every year in the presence of a large concourse. Mounted on his fleet steed, scouring the plain, the Mongol is in his element. He hates a settled life, detests agriculture, and despises the industry of his meddlesome neighbours, the Chinese. Displaying extraordinary sagacity, patience, and endurance in the field, his intelligence in all else is that of a child. With the most eager curiosity, repeating question after question, he fails to understand the simplest thing.

The Mongols are Buddhists by religion, for which their natural indolence well befits them. One third of the male population belongs to the class of clergy so called Lamas, who exercise an almost unlimited influence over their secular brethren. In all the ordinary affairs of life their opinions are consulted and followed implicitly: if a cow has fallen ill or strayed from the herd, or if a journey has to be performed, recourse is always had to the priest, who at length (such is the respect paid to him) believes himself endowed with supernatural powers. Urga is the headquarters of Lamaism in Mongolia, and ranks next to Lhassa in Tibet as a place of pilgrimage. Here resides the *Kutuktu*, an important personage in the Buddhist world, ranking third in the hierarchy, and enjoying large revenues derived from land and slaves, as well as from the offerings of the faithful. It is a curious sight to meet a Mongol prince on his way to pay his vows at one of the great shrines. He travels with his yurta or felt tent, his family, a large retinue of attendants, and a flock of several hundred sheep to supply them with meat *en route*.

In the south of Mongolia the inhabitants are Chakhars, whose territory lies for several hundred miles outside the Great Wall. They live partly with the Chinese, and owing to frequent intermarriages with the latter for many generations past, have lost the distinctive Mongol type, resembling the Chinese in external appearance, and closely imitating them in dress and manners. But they are bad specimens of

both races, for while they still cherish their native indolence and aversion to toil, the good qualities which they inherited from their primitive ancestors are entirely lost in the degrading vices learnt from their adopted countrymen. They are opium-smokers, rogues and thieves of the first water, and the traveller must beware in passing through their country of losing everything of value in his possession.

So much for the Mongols—let us now give a glimpse at the border-land of the Celestial Empire. From the northern bend of the Yellow River or Hoang-ho, on the west to the gulf of Pechihli on the east, extends a formidable girdle of mountains, which define the high arid steppe from the rich low plains of China. This, from the earliest historical times, served as a place of gathering for the hosts of barbarians who from time to time swept a wave of conquest and desolation over the thickly populated but defenceless plains beneath. The *Great Wall*, which runs along the axis of the range, built with incredible labour, under the supervision of the Emperor and his officers, was no check to the inroads of enemies, and it is difficult to say what could have been the motive for such a waste of national strength. These mountains, like all other ranges of Mongolia, are only developed on one side, *i.e.* towards the plain at their base; from the opposite side the traveller imperceptibly ascends through low hills until suddenly a magnificent panorama unrolls itself at his feet. Wild peaks, rocky valleys, precipitous cliffs—in fact Alpine scenery with all its grandeur is before him, with many a silvery stream and populous town or village in the distance.

Two distinct chains of mountains must now be descended, separated by a plain. At the foot of the first pass stands Kalgan, a large Chinese town, and the emporium for the overland tea-trade; at the foot of the second, Nankow, well known to Europeans. The contrast between the rigours past and the genial warmth which now greets the traveller is remarkable. But it is not our purpose to describe those better known parts of the Celestial Empire, so we will return to its borders in the far west. Here some hundreds of miles from its mouth the Hoang-ho makes a great bend to the north, till it is stopped by mountains which form a continuation of those to which we have already alluded, and, after flowing for some distance to the east, takes a southerly course, embracing in this way a great peninsula of territory, which is called Ordos, after a people of that name, who derive their descent from the Mongols. This is for the most part a waste of drifting sand, probably at one time the bed of a great lake, only becoming fertile in the valley of the river itself. Numerous are the legends and traditions connected with this country; in all of which the great figure of Jinghiz-Khan stands forth as the hero. Here he slew countless numbers of his enemies, and to this day it is related how the groans and shrieks of the spirits of the departed add to the terrors of the surrounding wilderness.

Equally sterile, gloomy, and monotonous are the plains of Ala-shan, situated to the west of the Yellow River, *i.e.* on its left bank.

As the traveller advances westward towards Kan-su he will see traces everywhere of the great Dungan insurrection, which has lasted upwards of ten years, and at first threatened to shake the power of the Manchu government. Had the rebels shown more energy and resolution, and had they chosen to act under one leader, the 4,000,000 of Muhammadans, scattered in all parts of the Chinese Empire, might have risen as one man, and carried the banner of the Prophet in triumph to the very walls of Pekin. But, satisfied with throwing off the yoke of China, and taking possession of some of the towns in Western Kan-su, they devoted themselves to loot and plunder the surrounding country, driving off the cattle and slaying the unfortunate inhabitants. The Chinese in their turn assumed the offensive, and now they are gradually re-establishing their authority in the revolted districts.

Kan-su, the westernmost province of China Proper, and the seat of the Muhammadan rebellion, is a very different country to any part of Mongolia. Owing to the dampness of its climate, its rich loamy soil, sheltered valleys, and lofty mountains, vegetation is abundant and varied; birds, too, abound, especially songsters; in fact, the flora and fauna of this region bears some resemblance to the Himalayas. Chief among plants deserving of notice is the medicinal rhubarb *(Rheum palmatum)*, which grows in great perfection in sheltered spots on the lower slopes and in the valleys, and is even cultivated in the gardens of the inhabitants, among whom it is a favourite remedy for themselves and their cattle. The hillsides are clothed with splendid rhododendra, including four kinds hitherto unknown, one of which, a magnificent shrub with white flowers, attains a height of 12 feet. In fact naturalists would find a wide scope for their labours in these districts, so bountifully endowed by nature.

The most useful domestic animal here is the *yak*, combining all the qualities of an excellent milch-cow with the strength and endurance of a beast of burden. Colonel Prejevalsky says that, heavily laden, it will swim across deep rivers. Ladies are acquainted with yak lace made from its hair, but good cloth is also manufactured from it by the Chinese which serves as clothing for the natives, and is well adapted for the moist climate.

The inhabitants are chiefly Tangutans, a race closely allied to the Tibetans. Their habitations are black tents or, where timber is plentiful, wooden huts. In appearance they resemble gipsies, and are distinct from the Mongols, although they prefer a nomad to a settled life, and are chiefly engaged in pastoral pursuits, rarely cultivating the soil. Unlike the Mongols, they are inhospitable, cunning, and avaricious, and one of their tribes, the Kara-Tangutans, inhabiting Koko-nor, is notorious for its predatory habits. As we ascend the head-waters of the Yellow River the mountains become higher and higher, until near Koko-nor they attain the limit of perpetual snow.

Koko-nor, or the Blue Lake, lies at an elevation of 10,500 feet above the sea, surrounded by mountains which set off the dark blue waters. It is about 200 miles in circumference, and has an island near its south-western shore inhabited by ten hermit Lamas, whose only communication with the shore is in winter over the ice, there being no boats on the lake, and the inhabitants not understanding navigation. A curious tradition is told by the natives with reference to its origin, of which the following version is nearly the same as that related by Huc, with the single addition of an allusion to the island:—In olden days, before the

present residence of the Dalai-lama was built, one of the sovereigns of Tibet thought of building a splendid shrine in honour of Buddha, and, having selected the site, commenced building. Several thousand people worked at it for a year, but no sooner was it on the point of completion than the whole building suddenly fell to ruins. The work was recommenced, and a second time it fell to the ground from some unknown cause. This was repeated a third time. Filled with surprise and alarm at such a strange catastrophe, the king had recourse to a Gigen to tell him what was the cause of such a strange phenomenon. The prophet however could give no satisfactory answer, but told his master that in the remote East there lived a holy man who alone of mortals knew the secret, and that if he could make him divulge it, the building might be finished. Upon hearing this, the monarch chose a trusty Lama, and despatched him to look for the holy man.

The envoy spent several years in travelling through the Buddhist countries, visiting all the most famous shrines, seeing and conversing with all the *gigens*, but without discovering the man answering to the prophet's description. Disgusted with the ill-success of his mission, he resolved to return home. One day as he was riding through one of those extensive steppes which lie on the borders of China and Tibet, the buckle of his saddle-girth broke, and seeing a solitary little hut at the edge of the plain, he entered to get it mended. There he saw a blind old man praying, who rose and welcomed his guest, offering him a buckle from his own saddle, and inviting him to drink tea, inquired of him whence he had come and whither he was going. Unwilling to disclose the object of his journey, the Lama answered that he was a native of the East, and was travelling with the object of praying at the different temples. "Ah! we are fortunate," said the old man, "in possessing so many gorgeous temples. They are trying to build one in Tibet, but they will not succeed because, beneath the site they have chosen, there is a subterranean lake which undermines the foundations. But prithee, keep this secret, for if the Tibetan Lamas were to hear of it, the waters of the lake would come here and drown us."

Hardly had he finished speaking before his guest started from his seat and, announcing that he was a Tibetan Lama who wanted to know the secret, jumped on his horse and galloped away. Despair and fear took possession of the old man. He began calling loudly for help, and as soon as one of his sons, who was tending the herd not far off, came in, the old man bade him quickly saddle a horse, overtake the Lama and cut out his "tongue," of course referring to his secret, and by ordering his son to take it, he authorised him at the same time to kill the Lama. But the word "Khileh" means in Mongol the tongue of a man or animal, and also the tongue of a buckle to a girth. Therefore when the messenger overtook the Lama and told him that his father desired him to return his "khileh" he unfastened the buckle which he had borrowed and willingly surrendered it. On receiving it the son returned to his father who, on learning that the buckle of the girth had been brought back and that the Lama had been allowed to continue his journey, exclaimed "God's will be done! all is over! we are lost!"

True enough that night a fearful subterranean noise was heard, the earth opened, and water poured forth which soon flooded the plain. Many people and cattle perished, the old man among their number. At length God took pity on sinful mortals. At his command a wonderful bird appeared which took up in its claws a great rock from the Nan-Shan Mountains, and threw it into the fissure, out of which the waters were issuing. The inundation was checked, but the flooded plain remained a lake, and the safety-bringing rock became an island which may be seen at the present day.

The water of Koko-nor is extremely salt. It is fed by a few streams, the most important of which is the Pouhain-gol with a course of about 260 miles (according to the natives) from the Nan-shan Mountains, where it takes its rise. Its valley is from 8 to 10 miles wide, and is bounded on the south by a lofty range, which extends along the southern shore of the lake, continuing for a great distance to the westward, where it probably unites with the northern range. Between the mountain system of Koko-nor and the frontier of Northern Tibet lies the saline marshy plain of Tsaidam.

E. DELMAR MORGAN.

EXTRACTS FROM LETTERS FROM MR. NEY ELIAS.

THE following interesting extracts from a letter of Mr. Ney Elias's, dated Bhamo, 4th January, 1875, (before the catastrophe of Col. Browne's expedition) were sent by Mr. Elias's correspondent to the Editor many months ago, but through an accident were not then inserted. The first passage was communicated in illustration of Marco Polo's statements about the absence of "Leeches" (or medical men), and the practices of Devil-conjurors, in Yunnan. The second in illustration of his story of men with tails:—

Here is an epitome of the yarn that an old Lenna Pawmine (or sub-chief) spun to me entirely spontaneously:—

"In the beginning the chief *Nat*, or spirit, Nūn Kwan, gave all the nations medicine seed, and they all took it to their respective countries and sowed it. The Kachyns sowed them in the hills, but as soon as it came up the buffaloes came and ate it; then they tried it in the plains, and the pigs and rats ate it; and lastly, they tried to grow it close to the water's edge, but here the fish used to jump out of a night and devour all the medicine as soon as it came up. Thus there was no more medicine left, and no scope for doctors. Therefore, when a person falls ill, they appeal to the 'Devil conjurors,' who find out what animal's ancestor ate the particular medicine good for the disease in question, and recommend the sacrifice of one of its species for the cure of the sick person—that species of animal being responsible for the want of the necessary medicine." He gave me no particulars of the actual proceedings of the "Devil conjurors," but I hear from other sources that there is dancing, &c., as Marco Polo describes, while the main feature—that of sacrificing animals—is prominent in both stories.

On the way up here to Bhamo, I fell in with a man named William B——, an orchid collector for some nurserymen at home, who has travelled in some of the most out of the way places in the world. He *volunteered* the information to us all on board the steamer that he had seen men with tails, and was of course laughed at. I questioned him about it afterwards, however, and this is what he told me: He sailed from some port in the Philippines (I forget the name) in a country boat, and after cruising among a number of

islands to the Sound, he one morning made the N.E. coast of Borneo. In the afternoon he went on shore to look for orchids, and was met by some very low-looking people, who had tails about the size of his middle finger —the tails were apparently stiff, not movable. The people were not quite black, and though of a very low type, scarcely so low, he thought, as the aborigines on the northern part of Luzon, who live in trees without ladders to go up by, or as the cave-dwellers he had seen on the Spanish main.

The men went naked, but the women wore a slight-bark covering, and he did not notice any peculiarity about the thumbs or toes, or the length of the forearm. He walked through the jungles during the afternoon, followed by some of the people, but found no orchids, and not liking the look of things, went on board; in the evening sailed away still further to the Sound.

Next day he landed again and found people without tails. He saw none of the habitations of the tailed people during his short visit, and no *perforated stools*; but he saw that some of them carried a kind of spear, and he feared their being poisoned. Mr. B—— (who is a man of very slight education by the way) had never heard of tailed men, and was much struck when I showed him your note at p. 244 of vol. ii. He is not quite clear about the geography of the places he has visited, but thinks, in this instance, he was on the extreme N.E. peninsula of Borneo, whilst less than a day's sail to the Sound carried him out of the region of "taylords."

RECENT JOURNEYS IN PARAGUAY.

(Continued from page 273 of our last number).

AFTER crossing the Upper Aquidaban our homeward route lay along the north side of this river, at varying distances from it, generally through woods more or less dense, and from the heights between the little tributaries occasional fine views over the forest-clad valley of the Upper Aquidaban were obtained. Beyond the arroyo Guasú, the largest upper tributary, a very remarkable chain of isolated hills, of most irregular outline and generally with precipitous sides, is known as the Cerro Sarambi or the "scattered" hills.

At the pass of the Guasú we came upon a party of Cangua Indians, fishing in the arroyo. Though this tribe is said to be numerous, these were the first and only Indians met with on this journey; this is perhaps to be accounted for by their aversion to mix with strangers, and their desire to keep their dwellings concealed. In appearance they differ a good deal from the civilised Guarani: the men were of good height and proportions, the women small; their skin is of a dark-red brown, the hair coarse, black, and long, coming over the brow, where it is cut across above the eyes; the face is oval, the brow wide, and the expression more or less intelligent and bright. The eyes, slightly turned up at the outer corners, and the mouth, strongly curved downwards, give a peculiarly Mongolian appearance, though the nose is aquiline. For dress they wear a simple waistbelt of cloth; the men have a chin ornament consisting of a spike of amber-like gum 2 or 3 inches long, passed through a slit in the lower lip depending on the chin, and kept in its place by a cross head. From one of them I obtained a bow of black hard wood, 7 feet long, strung with a cord made of aloe fibre, and an arrow 5½ feet long, made of cane with a barbed hard wood point. Their other weapon is a sort of short spear or pike.

On passing the Arroyo Puente Cuhá (hammock bridge), we skirted the base of the Cerro Tranquerita, a long isolated mass with a perfectly level top surrounded by a cliff edge. From this point westward to where we again struck the Aquidaban at the Paso Mbotú the country assumes an appearance exactly like that through which we had passed in going northward to the Apa, the woods giving place to park-like scenery, and ultimately to fine palm dotted grass camp.

Hydrography of Paraguay.—The two great rivers which enclose the country are the Upper Paraná and its tributary the Paraguay, but these differ in character in every respect. The portion of the Paraná* with which we have to do lies between the cataract of Guayrá in lat. 24° 4′ 30″ S., on the Brazilian frontier, and the confluence of this river with the Paraguay at the south-western corner of the country. For the first accurate map and description† of the higher portion of the river, from Ytapua to within 7 leagues of the Salto Guayrá, we are indebted to the commander of the Brazilian gunboat 'Tacuary,' which has been stationed for some time at the pass of Ytapua, near the point where the upper river turns westward. In 1874 the commander of this small vessel received orders to proceed up the Paraná to bring back the members of the Commission of Limits, who having concluded the survey of the northern frontier along the line of the Apa and the cordillera to the Salto of Guayrá returned by the easier water route to Asuncion.‡

The Boundary Commissioners, who remained for more than a month in the immediate vicinity of the great fall of Guayrá, and made accurate measurements of it, fully confirm the description given by Azara of this magnificent cataract:—"At the moment when the river precipitates itself it has, in its average state, great depth, and a width of 4470 yards (2100 toises), or nearly a marine league. This enormous width is suddenly contracted to a narrow gorge of only 65 yards (30 toises) into which the whole mass of water plunges with terrific fury. . . . The waters do not fall vertically, but in a plane inclined 50 degrees to the horizon, giving a height, in a perpendicular direction, of nearly 60 feet. The spray or vapour, which rises in columns at the moment when the waters strike the walls of the rocky gorge, or some points which stand out in the middle of the precipice, may be seen for several leagues round: close at hand in the sunlight they form rainbows of the most lively colours, in which a tremulous movement may be observed; moreover, these vapours fall in an eternal shower of rain in the neighbourhood of the fall. The noise of the cataract may be heard for six leagues round."

For some leagues below the great fall the river is hemmed within the narrow gorge, rushing down over reefs and rapids in which no boat could live. For

* *Para*, the sea; *ná*, like (Thompson).

† Report by Commr. J. A. de Alvarim Costa and Lieutenant Frederico Ferreira de Oliveira, published in the Brazilian *Diario Official*, 1874.

‡ When at Ytapua, I had the pleasure of inspecting the large scale chart of the upper river made by Commr. Costa: without permission from head-quarters, however, it was not possible to allow me to have a copy of the MS., and I have not been able to make use of it in the sketch map.

9 miles beyond this, in the portion examined by Lieutenant Oliveira with the boats of the 'Tacuary,' the breadth of the river is from 190 to 240 yards, the current from 5 to 6 miles an hour. The highest point reached by the 'Tacuary' (in about 24° 30″) may be considered as the limit of the navigation of the Paraná from the ocean. In the portion between this limit point and the mouth of the Ŷ-guasú or Curityba the width of the river increases gradually from about 240 yards to 600 yards, but frequent sharp currents, whirlpools, and eddies render the navigation still difficult, and in some places dangerous.

From the Curityba down to Ytapua the breadth of the Paraná increases from an average of 1200 yards to where it attains a majestic expanse of nearly 3000 yards: the current of this lower section is estimated by Commr. Costa to average 3½ miles per hour, though more rapid currents are frequently met with. Very remarkable and sudden bubblings up of large masses or mounds of water in the more turbulent parts of the river, are characteristic of the Paraná throughout, and may be accounted for by irregularities in the rocks which form the bed of the river, against which the water being driven by the strong current rises in a spiral form to the surface. The banks of the Paraná above Ytapua are uniformly high and rocky, either precipitous or with steep, forest-covered slopes, and almost every one of the numerous tributary rivers and streams tumbles into the bed of the Paraná, forming often a splendid succession of falls and cataracts on each bank. One of the finest falls is that of the Ŷ-guasú (great water), the largest tributary from the east, but this one is distant two leagues from the mouth of the river.

Below Ytapua the Paraná turns westward, and though the current remains strong, the river assumes a somewhat different character to that of the northerly portion: its banks are now low, and bordered, especially on the northern side, by vast marshes, known by the general name of Neembucú, "the endless." Not far below Ytapua the river divides into a northern and southern "riacho," embracing the large islands of Yacireta and Apipé. The rapids of Santa Maria on the southern branch, and of San José-mi on the northern side of Yacireta, interrupt the navigation when the river is low, though they are easily passed when the river is in flood, and but small engineering labour would be requisite to make a navigable passage here at all seasons.

Downwards from Apipé to the confluence of the Paraguay very numerous banks and islands occur in the river channel, which spreads out in width, till, above the town of Corrientes, it is more than 2 miles from bank to bank. Considerable use is now made of this section of the Paraná as a highway of traffic: four steamers a month, taking cargoes of yerba, wood, and tobacco, in exchange for general stores, regularly navigate the river from Corrientes up to the now rapidly growing village of Ytuzaingo (formerly the Tranquera of Loreto), situated on the Correntine shore, opposite the island of Apipé, and immediately below the rapids which first obstruct the river. From this place to Ytapua or San José, also a flourishing settlement of mixed Argentines, Brazilians, and Italians on the south side of the river, opposite the old Jesuit reduction of Encarnacion, communication is maintained not by river but by road, on which carts pass regularly to and fro in connection with the steamers at Ytuzaingo. The small canoe port of San Cosme, in the Missions, carries on a little traffic with Ytapua, exchanging tobacco for provisions. An idea of the strength of the current of the Paraná at this place may be formed from the fact that the canoes from San Cosme take two days to go up to Ytapua, but come back with the stream in four hours. Traffic above Ytapua is confined to the transport of yerba collected at the two Paraguayan settlements of Pirapitai (or Villa de Azara) and Tacurupucú, above and below the mouth of the Rio Munda-y,* in 25° 20′ and 26° S. lat.

Canoes, small barges, and occasionally small steam-launches are employed in this traffic, taking up cattle for the supply of the yerba-workers, and bringing back the tea packed in large "canastas," or rough wicker-baskets, to be selected and re-packed at Ytapua and the surrounding settlements. Smuggling of yerba is carried on to a very large extent in this part of the Paraguayan frontier, and the government is apparently powerless to stop this infringement of the revenue: the amount of yerba which passed down the Paraná without paying duty in 1874 was estimated at 50,000 arrobas. The passes across the Paraná into Paraguay are now used chiefly in the cattle traffic, to which I have referred; those at which small steamers or canoes are placed, are the Paso de la Patria, near the confluence of the Paraná and Paraguay, and, in order, higher up the river, Cerrito and Yta-guaté, Ytuzaingo and San José-mi, Ytapua and Encarnacion, Candelaria, and Corpus. At Ytapua I was assured that the Paraná has no set time of rise and fall, although it has been compared in this respect by some of the Jesuit writers to the Nile: its risings are numerous, however, and prompt, much more so than those of the Paraguay, and it is said to become higher in December than in any other month. Capt. Page, in describing the Lower Paraná, says: "The rise of the water, which begins in December, is about 12 feet: it reaches its maximum in August. There is also a partial rise of 6 feet in October, which, rapid and transient, continues one month, and then falls to its former level in the same space of time."

The Paraguay, surveyed in 1853-1856 by Capt. Page, in the U.S.S. 'Waterwitch,' has been so fully described by him, that I shall only refer to his work.† Besides being only a sixth part of the width of the Paraná, at the confluence of the two rivers, its current is less rapid and more uniform, not exceeding 2 miles an hour, excepting in a few places. Riachos or lateral channels are very frequent, while these are absent altogether in the corresponding southerly portion of the Upper Paraná. The wooded banks are almost uniformly from 10 to 15 feet above the level of the river, the country on each side being generally low, and wherever they have fallen into a little cliff by the action of the river, they present a level stratification of sand or clay beneath the thick layer of surface soil. The rise and fall of the Paraguay are also regular: the lowest stage is reached in the end of February, the highest about the end of June,

* Thieves' river.

† *La Plata, The Argentine Confederation, and Paraguay.* By Thomas J. Page, U.S.N. New York, 1859.

between which seasons there is a gradual swelling or decrease. The average limit of rise and fall does not appear to exceed 15 feet. Azara states that the waters have attained a height at times of 30 to 40 feet above their mean level, but no such extraordinary rise appears to have taken place recently. Azara and Page have each measured the volume of the Rio Paraguay at Asuncion, with results which correspond very closely; both have carefully measured the width of the river at Asuncion, and dividing this into three sections, have ascertained by sounding and floats the depth and rate of current in each, the former obtaining a result of 359,816,000 cubic feet,* the latter 350,618,000 cubic feet an hour, as the volume of the river at an assumed normal level.

On account of its gentler and more uniform character, the Paraguay is a much more important highway of communication than the Upper Paraná can ever become, affording as it does a waterway into the far interior of Brazil, to points more than 1500 miles distant from the ocean. Four steamers, making fortnightly trips, navigate the Paraguay as far as Asuncion, keeping up communication between that port and Buenos Ayres; two other steamers, belonging to a Brazilian company, starting from Monte Video, touch at Asuncion in passing up the river to Curumba and Cuyaba in the province of Matto Grosso, and by means of these more or less regular packets, the larger part of the interchange of goods is effected. Besides these a number of small Italian schooners find their way up to Asuncion, though the voyage against the strong current of the Paraná is a work of much time. It appears that it is not at all uncommon for such vessels to spend six months in ascending the river, and they are often to be seen moored wind-bound to the trees on the bank, for weeks at a time.

The tributaries of the Paraguay, unlike those of the Alto Paraná, are almost without exception navigable in a greater or less degree, and in this way are available for opening up the resources of the country. The most northerly of those which spring from the central cordilleras of Paraguay, is the boundary river, the Rio Apa,† flowing a little below the 22nd parallel. Page ascended this river for 6 miles from its mouth, finding its general width about 300 yards, its depth not less than 9 feet, and the banks low; in 1873 the Limits Commission navigated it in a small canoe up to its confluence with the Estrella, requiring only one portage, at a quartz reef which crosses the river bed at about 40 miles from its mouth. The canoe was afterwards taken up the Estrella head-stream to within 16 leagues of its source.

The character of the Aquidaban‡ (the next river to the south) is different to that of the other large tributaries of the Paraguay in this region; its current is rapid, the channel stony and perfectly innavigable; it is remarkable also for its quick rise and fall. An instance of this came within our own experience; the Paraguayan section of the Limits Commission crossed it at the Paso Mbotú during a violent rain and thunder storm, the river being then at its average height; the Brazilian section arriving an hour or two later at the pass found the river so swollen as to make any crossing impossible.

The Ỹ-pane is said to be navigable only by canoes on account of its reefs, but considerable use appears to have been made of it in former times for transporting yerba from the interior to the depôts at Concepcion.

The Jejuy (or Xexuy) next in order, southward, is a more important river, with a large drainage area. It has a depth of water generally of from 6 to 9 feet,* though in time of drought this may be reduced to 1 foot; large barges float down it from Curuguati and other points in the Yerbales through which it passes, conveying the yerba 'tercios' to San Pedro, near its mouth or down to Asuncion. Lieutenant Ammen of Captain Page's expedition ascended this river in a small steamer at time of lowest water, to a short way beyond San Pedro, but found it impossible to go farther at that season; a succession of sand-bars occur in this part of its channel, and the current was estimated at 3½ miles an hour. The chief northern tributary of this river called the Aguara-y (fox river) is remarkable as having the highest fall known in this region of South America. Azara gives the height of this fall, which he terms 'el mayor del mundo,' as 409 feet (149¾ varas).

The Tapiracuá, Manduvirá, and Pirebebuy are smaller tributaries, and do not appear to have been turned to much account for navigation, excepting that by means of the last named, a great part of the heavy machinery used in Lopez arsenal at Caacupé on the cordillera, was conveyed to the base of the slope. The lagoon or marsh of Aguaracaty, bearing also different local names in some parts, extends across the basins of the two former of these rivers between 24° 30′ and 25°, and is alternately covered with water or almost dried up, varying with the rainfall or drought. A fine valley between the plateau on which Asuncion stands, and the Cordillera of Altos contains Lake Ypacaray, a beautiful sheet of water 12 miles in length by 2 in average breadth; the lake is fed by the Arroyo Piraju, and its outlet river, named the Salado, is navigable to the lake for small boats, a number of which were formerly used on the lake for fishing.

By far the most important river of the interior of Paraguay is the Tebicuary, the basin of which occupies a large area of the south-western and central districts of the country, and since, in its main channel, and in its various tributaries, it affords navigable highways, ramifying over a great extent of country, it will doubtless play a great part in the economy of Paraguay if more fortunate days are in store for the country. Its chief head-stream, the Tebicuary-guasú, rises in the cordillera in about 26° S., at a distance of not much more than 20 leagues from the Upper Paraná; the Tebicuary-mi, or smaller source-stream has its rise farther north, behind the summits of the Cordillera of Villa Rica. These main tributaries

* Azara records in the MSS. previously referred to that he calculated the volume of the Paraguay, as above described, at the lowest stage of the river he had ever seen, and found it 212,218,607 cubic Paris feet an hour; he assumed the average volume as half more, or 318,422,410 cubic Paris feet.

† More correctly perhaps Appa, a name given by the Mbaya Indians after their invasion and occupation of Northern Paraguay in 1661, instead of that of Corrientes, given by the first Spanish settlers.

‡ Also re-named by the Mbayas; formerly it had the Guarani name Pira-y or fish river.

* Demersay.

unite not far from the hills of Santa Maria in the Missions, forming the main Tebicuary, which pursues a tortuous course westward to the Paraguay. The greater Tebicuary is navigable from above the village of Yuti, and a considerable number of rudely-built barges, or rafts of squared timber, are annually sent down from near this place at times of flood. A brief record of a voyage down this tributary and the main channel to the Paraguay, is given in a part of Azara's diary, published after his death.* He reached the Paraguay from Yuti in eighteen days. In company with Mr. Charles Congreve, I descended the smaller Tebicuary in February and March of this year, starting from the village of Ytapé near Villa Rica, passing down into the main river and reaching the Paraguay after twenty-two days of continual paddling and sailing. A rough compass sketch-survey, checked by latitudes, was made as we went down; unfortunately the notes and sketches of the upper portion of the river were lost by the overturning of our canoe in the Paraná a few weeks later, but the portion from Paso Santa Maria downwards to the Paraguay was preserved.

From Ytapé southward to its confluence with the greater branch, the Tebicuary-mi is excessively tortuous, often doubling back on itself for miles; so much is this the case that in one day of incessant paddling during six hours, in which we must have gone at least 18 miles, the difference of latitudes between the halting-places was less than 5 miles. The river was at its lowest when we descended, and curiously formed sand-bars, stretching diagonally across the channel, obstructed even the light draught of our canoe; marks on the banks, however, show that the river may rise to 10 or 15 feet above its low level, when all shallows might be easily passed. At a short distance below Ytapé, a considerable 'obraje' or wood-cutting work is in operation; the timber is roughly squared and sent down in rafts. Near this place we came upon a small stranded steamer, unable to make its way up to the 'obraje'; the presence of this vessel, which had been brought thus far as an experiment, was a practical proof of the navigability of the river, since her draught exceeded 4 feet. The banks of the river, both in this branch and in the main stream, are generally low and densely wooded; here and there, however, a 'barranca' of about 20 to 25 feet in height occurs, and almost invariably proves to be the edge of a great plain of tall rank grass. The edges of these grass plains where they abut on the river, are invariably perpendicular and cliff like, and much higher than the gently sloping, wooded banks. The current at the low stage of the river may be said to average 2 miles an hour, the width varying from 40 yards at Ytapé to about 150 on an average near the Paraguay, the depth from less than a foot to 15 feet. In flood the current is doubtless much more rapid, and the width and depth are proportionately increased. With the exception of one reef of basalt rocks below the pass of Santa Maria (in latitude 26° 30' S.), over which there is a rapid, falling about 4 feet in the low stage of the river, the Tebicuary presents no obstacle to navigation. Its times of rise and fall are irregular, and are simply dependent upon the passing rainfall; when it rains the river rises immediately, and it sinks as quickly when dry weather sets in. With the exception of Yuti, near the greater Tebicuary, and Ytapé, on the Tebicuary-mi, there are no villages on the banks of the river, which flows through much uninhabited country. The pass-house of Santa Maria, on the chief track to the Missions, is the only habitation seen in descending, till the pass of San Fernando, close to the Paraguay, is reached: for eleven days at one time in going down we did not see the least sign of human life. I would commend the river to sportsmen: the woods on its banks are full of large and small game of every sort known in Paraguay, and the sandbanks at every turn are marked over with the fresh tracks of wild animals. Ducks and wild birds of every kind are in thousands; the waters teem with fish, and we have counted as many as 16 alligators lying within a space of a few yards.

The chief tributary of the Lower Tebicuary is the Rio Negro from the north, the main outlet of the Lagoon of Ypoá and of the marshes which surround it; this great lagoon is upwards of 100 square miles in area, and is surrounded by an immense tract of marsh land; it receives the river Caanabé, from the plain of Paraguari and the hills which surround it, and has several marshy outlets or slow drains to the Rio Paraguay besides this chief one to the Tebicuary. At Tabapi, near its north-east shore, I was informed that its waters are perfectly fresh, and that it abounds in fish; it is very shallow and its extent is very variable; the winds have a great effect on its surface, and when blowing strongly from north or south drive the water of the lagoon away from one shore over the marshes of the other. Though the borders of the lagoon are swampy, its bed is of firm white sand. Between the Tebicuary and the Paraná the greater part of south and western Paraguay is occupied by a series of vast marshes which run back, up the bank of the Paraná, as far as the island of Yacireta. The chief of these is that named Neembucu; and this name is generally applied to the whole range of the marshes of the Missions, which are all more or less connected one with another. But the name properly belongs to the more northerly swamp, which lies between the elevated plateau of Santa Maria and Santa Rosa, and the Rio Paraguay, which discharges itself by the Rio Neembucu at Pilar. The Yabebiri, joining the Paraná below the island of Apipé, is another chief drain of the marshes. A striking proof of the movement of the waters of these "esteros" was afforded during the war, when Colonel Thompson, attempting to raise dams or ramparts for the purposes of fortification across some of the apparently stagnant marshes in the neighbourhood of Humaitá, found the water gradually rising behind his earthworks and rendering them useless.

Little or nothing is known of the minor tributaries of the Paraguay coming from the western or Chaco side; even the names of their mouths appear to be uncertain. The two main Chaco tributaries in the space opposite the Republic have, however, been the objects of a considerable amount of interest and exploration.

The Pilcomayo is well-known at its mouth in

* *Diario de la navegacion del Rio Tebicuary:* Buenos Ayres, 1834.

the Paraguay opposite Asuncion, and in its head streams from the Andes between the 19th and 22nd parallels; but for information respecting its course through the Chaco, we are as yet dependent upon the accounts of two travellers only, one from the side of Paraguay, the other from the Bolivian side, neither of whom explored the river through its entire length. although their routes overlap one another. In 1721 the Jesuit father Gabriel Patiño accompanied by three others, an officer named José Portillo, six Spaniards and sixty Guarani Indians from the Missions, embarked on the 'Pilcomayo' on the 18th of August, in a flotilla consisting of one large barge of eighty-seven tons, and two flat canoes made expressly for the work. The first 60 leagues presented a well-banked channel and deep water with lateral lagoons, which rise and fall according to the state of the rivers. Trees fallen across the river frequently hindered the passage. From this to the bifurcation of the river many shallows occurred, and banks of sand and ridges of hard clay soil crossing the stream formed rapids which were passed with difficulty. After twenty-five days of voyaging and at a distance from the mouth estimated at 94 leagues (210 miles), Patiño arrived at a place where the river separated into two branches, 7 leagues above a rapid which had to be overcome by cutting a canal through it, a work which occupied ten days. Finding that the large vessel could not pass up further, Patiño resolved to leave it here with half of his escort, and with the two canoes and the rest of his party he continued to ascend. A distance of 80 leagues more was made without difficulty in a well-defined channel, sometimes bordered by woods, sometimes by beautiful park-lands. Several banks of slimy argillaceous soil now occurred, over which the water passed, forming a kind of rapid, and similar barriers extended over 33 leagues (75 miles). After this the Pilcomayo again became deep between high barrancas. It was now easy to see that the whole country was much higher, and trunks of trees evidently brought down in the rainy season from a mountainous region were now and then met with. Traces of Indians became frequent, and it was evident that the country was inhabited. This peopled region began at 100 leagues (230 miles) above the bifurcation of the river, and continued for 170 leagues (390 miles) to where villages of Tobas Indians were met with. These Indians attacked the expedition on the 2nd of December, and forced it to retreat. In twenty-eight days, travelling day and night, Patiño and his companions regained the place where they had left the larger vessel. This is the only considerable expedition which has ever tried the navigation of the Pilcomayo from the Paraguayan side. Azara indeed records that he ascended and mapped the Pilcomayo for 20 leagues, but has given no particulars in his published work. In 1843 an expedition sent by General Ballivian, then President of Bolivia, for the exploration of the Pilcomayo in three large vessels, failed on account of the deficiency of depth of water; but in the following year a second expedition, composed of a company of 56 men, under Major Acha and Lieutenant Van Nivel, in three barges and eight canoes, set out from the confluence of the upper tributaries on the 30th of September, and proceeded down the river without difficulty till the 5th of October. After several upsets it was decided to abandon the canoes and some part of the stores, and until the 10th progress was made in a channel of 4 to 5 feet in depth. On the 11th the flotilla came to an immense sandy plain, where the Pilcomayo separated into about sixty small branches, all of them innavigable. Up to this point they had reckoned 189 leagues (440 miles). Rounding these sands on foot in two days' march, during which they were attacked by Indians, the voyagers reached the river channel again below, and followed its course for nine days, counting thirteen rapids. After the last of these the river lost itself again in a vast lagoon, apparently about 80 leagues in circumference. The provisions being now expended, the party began their retreat after travelling a distance which they reckoned at 389 leagues (908 miles). Their report of the innavigability of the Pilcomayo seems to have precluded any further attempt. M. Martin or Moussy who has examined these journeys critically in his work, concludes that the old channel followed by Patiño had been abandoned by the river at the place where the Bolivian expedition found the sand channels; and that the river had retained its course below that point where the same rapids described by Patiño were seen by the Bolivians. As regards the great lagoon of 80 leagues circumference, which arrested the expedition of 1844, it should be found at the place where Patiño came upon the great open lands and low banks, or 80 leagues (185 miles) above the bifurcation of the river.

In 1873 a half-hearted attempt was made to explore the Pilcomayo under the authority of the Argentine Governor at the Villa Occidental, and Mr. Robinson, C.E., then Government engineer in the Chaco settlement, ascended the river in a small steamer for a distance of 150 miles from the mouth, opposite Asuncion, when for want of proper supplies he was compelled to return. The windings of the Pilcomayo in this distance were found to be excessive, so that on the 5th day of steaming, the white houses of Asuncion could still be clearly seen over the level Chaco. The navigation, however, thus far proved easy, the least water found being 4½ feet.

The Rio Confuso, a river which joins the Paraguay a little farther north, is frequently marked as one of the hypothetical delta branches of the Pilcomayo. This delta theory, indeed, seems to have clung to the Pilcomayo at whatever age it has been mapped, though there does not appear to be the least authority for the supposition that it has more than one mouth, opposite Asuncion. An examination of the Lower Confuso made by Lieutenant Murdaugh, of Captain Page's Expedition, who went up it for 24 miles, proved that its character is altogether different from that of the Pilcomayo, and that it must have an independent rise. The Confuso water is bitter and saline; that of the Pilcomayo is brackish only when the river is unusually low.

The Vermejo, or Y-pytá (red water), the other great tributary of the Paraguay from the Chaco, is so named from the red colour of its waters, which at its junction with the Paraguay keep separate and red in contrast to the pure water of the chief river, but, afterwards mingling with them, tinge the whole of the lower river to its confluence with the Paraná. It is formed of two chief head-streams, which rise in the province of Tarija, fed from the Andes between

21° 30′ and 23° S. As early as 1585 the facilities presented by this river for opening up the wide area of the Chaco were recognized by the missionaries, when the little town of Concepcion was founded among the Mocovi Indians, on its banks. The first to descend the whole of the river by canoe appear to have been the Franciscan missionaries, Murillo and Lapa, in about 1780. In 1826 a company was formed in the Argentine Republic to undertake the navigation of the river, and a Frenchman named Soria was appointed to navigate and report on it. This he did, successfully descending the river from the confluence of its head-waters to the Paraguay in 70 days, only, however, to fall into the jealous hands of the Paraguayan Dictator, Dr. Francia, who, besides confiscating boats and plans, imprisoned unlucky Soria for five years. In 1855, however, a new company was formed, and a certain Captain Lavarello was entrusted with the first venture; in a vessel of 20 tons he descended in 50 days to the Paraguay.

In 1854 Capt. Page ascended and charted the Vermejo for 122 miles, but was obliged to return then on account of defects in his vessel. More recently the navigation of the Vermejo has been taken up in earnest at Buenos Ayres, and a concession has been obtained by a company for the navigation of the river. Eight trips a year are stipulated for in their contract, and these will greatly aid in developing the trade and products of the provinces of Salta and Santiago. In May, 1874, four of these round trips had been accomplished, and the regular navigation of the Vermejo has now become an established fact. Much of the credit of this enterprise is due to Don Natalio Roldan, the director of the navigation, who has succeeded in winning over the Mataco Indians to his confidence, and last year was employing them in large numbers in canalizing and clearing the river. It is remarkable that, from the junction of its head streams down to the Paraguay, the Vermejo does not receive a single affluent. Its breadth in this space varies from 70 to 250 yards, its depth from 5 to 16 feet, and the current appears to average about 1½ mile an hour. KEITH JOHNSTON.

(To be continued.)

THE HISSAR EXPEDITION.

THE return of the Hissar Expedition to Sher-i-sebz is announced as having taken place on the 13th of June last. The expedition explored the Khanate of Hissar from west to east, as far as the Baljuan and Kuhab Valleys, and among other work succeeded in identifying the positions of the famous pass of the "Iron Gates" close to Derbent, and of the remarkable Pulisangin stone bridge over the Surkhab. Another noteworthy discovery is that the Surchan is an important tributary of the Oxus, the very existence of this stream having been doubted by Fedchenko. A map will be prepared from the route survey laid down, and fourteen astronomical positions, determined by Herr Schwarz, one of the party, will be embodied in it. In our next number we shall notice this expedition more fully.

Reviews.

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INDIAN PUBLIC WORKS.*

THERE are few more important investigations, connected with the science of geography, than those which relate to the changes wrought by man on the earth's surface, either by his destroying or by his constructive efforts. The knowledge relating to public works is, therefore, from this point of view, as much the province of the geographer as it is, from other stand-points, of the statesman and the administrator. Hence a thoughtful book on the public works of India, such as that which Mr. Thornton has recently published, properly has a place among those which it is our duty to recommend to the notice of geographers.

Mr. Thornton's high position as a political economist, as well as his long experience in the department of public works in the India Office, give weight to his matured opinions, and will secure attention to the views which he has enunciated. But the book is one that would have had many readers even if it had appeared without the author's name; because it explains points which are of great public interest with remarkable lucidity, and makes clear many things which have hitherto appeared complicated and doubtful. This is especially the case in treating of the financial aspect of Indian public works.

The most important questions connected with public works relate to the principles which should govern their construction by the State; and these principles are more clearly stated by Mr. Thornton than in any previous work. It is a generally received doctrine, true enough within certain limits, that a public work to be successful must pay; but broader considerations than direct pecuniary profit should be brought to bear when the action of the State is concerned; and the collateral effects of a bridge or of a road easily occasion an addition to national wealth, amply sufficient to compensate for deficiencies in the net revenue resulting from tolls. This question, and the comparative advantages of governmental agency and of private enterprise, both abstractedly considered and with reference to the special circumstances of British India, are discussed in Mr. Thornton's introductory chapter.

In the second chapter the subject of communications is examined; and the history of the guaranteed railway system, together with the future measures that will become necessary when the time comes for deciding questions relating to the purchase of railways by the State, are very ably discussed and explained. Among many other points of interest in this chapter, we would specially direct attention to Mr. Thornton's statement of the advantages and probable results of the construction of a railway from the fertile plains of Dharwar in the south of the Bombay Presidency to the seaport of Carwar, in North Canara.

Over an area of 3800 square miles stretch the wide cotton fields of Dharwar, where alone the American species have been cultivated with great success. Hitherto the places of shipment for this cotton have been Cúmpta and one or two other open roadsteads; and although a good cart-road has been made down

* *Indian Public Works, and Cognate Indian Topics.* By William Thomas Thornton, C.B. (Macmillan, 1875.)

the Arbyle Ghaut to the excellent anchorage at Carwar, still prejudice and local interests lead to a preference of the old route, with its miserable road and wretched place of shipment. Mr. Thornton selects this instance as one in which he argues that, even if the traffic of the proposed Carwar railway is insufficient to make it pay, still it is by no means necessarily an undertaking in which the Government, as representing the entire public, might not very advantageously engage. Regarded from a national point of view, the indirect advantages of such a railway as that from Carwar to the Dharwar plains, might, Mr. Thornton maintains, be of themselves abundant money's worth for the money spent. He then enumerates the indirect advantages of railway communication, as follows:—

"Not only are old markets made more cheaply accessible, access to new markets afforded, and production stimulated by enlarged demand for its fruits, but capital in search of investments discovers fresh fields, and producers are placed in possession of better implements and made acquainted with better processes. Together with the passengers whom they carry about, railways distribute also certain impalpable entities—observation, intelligence, invention, technical skill, and miscellaneous information—distributing them moreover carriage free."

Dharwar, it appears, though it grows the superior New Orleans cotton, is yet so far behind hand in cultivation as that, whereas in India generally the average yield of cotton per acre is 73 lbs., in Dharwar it is only 24 lbs., although the produce of the New Orleans plant should be two or three times as great as the indigenous. If, therefore, the adoption of Carwar instead of Bombay as the ultimate port of shipment for Europe, should have no further effect than that of leading to the general substitution of New Orleans for indigenous cotton in local cultivation, and of raising the local yield per acre to the general average of India, an addition of more than 24,000,000 lbs. would be made to the total annual yield.

Such statements of the various considerations which should be in the statesman's mind in deciding questions of this kind, besides the mere figures representing direct profit and loss, are exceedingly valuable; and Mr. Thornton has done good service in so ably presenting them, both as regards this and other projects, especially that for running a line of railway into the heart of Chuttesgurh. For there is a fatal tendency, at present, to take a narrow view of government undertakings. There is danger that, in seeking to make a showy balance, to judge of enterprises by mere debit and credit accounts, all true statesmanship may be lost sight of. An administrator is not merely a shopkeeper, and in checking or abandoning an enterprise on such narrow grounds, it is probable that serious evil may often be done, that it will take years to remedy.

In the chapter on irrigation there is not only a good general view of the various systems prevailing in different parts of India, and of the methods of construction, but a discussion of the financial bearings of the question, especially with reference to the momentous points relating to a forced or voluntary payment for water; and in that on miscellaneous works there is useful information respecting harbours and lighthouses.

A yet more important section of Mr. Thornton's book is that on public works establishments—on the training, position, and treatment of functionaries in the public works department. In this chapter the absence of due confidence in officials, and the deprivation of all responsibility or discretion, is referred to as a crying evil. Mr. Thornton thus fearlessly speaks out on this point:—

"A wise private employer understands that he cannot get the best service out of the best servants without trusting them sufficiently to allow of their exercising considerable latitude of discretion. He may summarily discharge his gardener or his coachman if he suspects him of extravagance or dishonesty, but as long as he retains either, he leaves the one to judge when and what fires are needed in the hot-houses without standing over him to see how much fuel is used; neither does he go into the stables whenever the horses are fed, in order to prevent the other from stealing the corn. But governments in general, and the Indian Government in particular, behave as if they believed all their servants to be knaves, only to be kept from picking and stealing by being sharply and suspiciously watched. The aim seems to have been less to stimulate than to control activity, for which latter purpose a regular gradation of checks has been created; and it seems also to have been imagined that the force of control would be augmented by being arrested at a series of barriers, and filtered through a series of sieves."

Mr. Thornton's two last chapters on land tenures and on national education are of more general interest, and, as we are quite unable to concur with Mr. Thornton in the view he takes respecting the latter subject, we are glad that it is not one which comes within the scope of this Magazine. Mr. Thornton's work will be welcomed as containing a clear general review of the position of public works in India, as lucidly explaining several complicated points with reference to them, and especially as enunciating sound and statesmanlike principles in a thoughtful and suggestive way.

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JUMMOO AND KASHMIR.*

MR. DREW'S *Jummoo and Kashmir Territories* forms one of the most valuable additions to our knowledge of Indian geography, which we have been called upon to notice for some time past. The author, formerly of the Geological Survey of Great Britain, entered the service of the Maharaja in 1862, and remained in it during ten years. He was employed successively as a geological surveyor, as Director of the Forest Department, and as Governor of Ladākh. The duties of these offices called him into nearly every part of the country, and his geological training enabled him to render a trustworthy account of the physical geography of the regions explored by him, whilst his official position afforded him many opportunities of becoming acquainted with the social life of the people and its rulers, which an ordinary traveller generally misses.

The Maharaja's dominion extends over territories having an area of 62,000 square miles, with a population of about 1,500,000 souls, and offering the greatest variety as regards physical features and inhabitants. It rises from the burning plains of the Panjab to some of the highest mountain summits in the world, and is inhabited by races speaking thirteen different languages and professing three kinds of religion. In dealing with so complex a subject, a methodical arrangement of facts is desirable above all things, and in this respect the author leaves little if anything to be desired. There is system in his arrangement, and where the same or kindred subjects are of necessity treated of in various chapters, a compendious index enables us easily to refer to them.

* *The Jummoo and Kashmir Territories:* A Geographical Account, by F. Drew, F.R.G.S., F.R.S. London (E. Stanford).

The author, first of all, presents us with a general view of the geography and history of the country he proposes to describe in detail. He then introduces us into the region of the Outer Hills, describes their physical features, their vegetation, inhabitants and principal cities, inclusive of Jummoo, the residence of the Maharaja. He then takes us successively to the region of the Middle Mountains, to Kashmir, to Ladākh, Baltistan, and Dardistan, describing in every instance the roads which connect these separate portions of the Maharaja's dominions. Finally, there is a separate chapter on the languages, with a Dogrī grammar and comparative vocabularies, and an explanation of the very valuable set of maps which illustrate the volume. These maps deserve more than a passing notice, for it is but rarely that English works of travel are illustrated cartographically in so liberal and unexceptional a manner. The first of them is a general map of the Maharaja's dominions on a scale of 16 miles to an inch, and based almost exclusively upon the maps resulting from the Trigonometrical Survey of India. The hills are carefully shaded, and the glaciers, being coloured a bright green, stand out distinctly, and at once draw our attention to the most characteristic features of the Himalayan ranges. Elsewhere in this book there is an outline map of England, the object of which is to enable the reader to form some idea of the relative extent of Kashmir. A similar map of a portion of Switzerland, with the glaciers clearly marked, would have conveyed some idea of the vast extent of these Himalayan glaciers—and yet they are merely the remains of ice-fields, which in ages gone by covered nearly the whole of this region! The nomenclature of this and of the other maps has been carefully revised by Mr. Drew, and the names upon them are spelt according to the "official" system introduced some time ago, but followed as yet by hardly one amongst the numerous Government departments.

In addition to this general map there are five physical or ethnological ones, viz. (1) a Snow map, showing the glacier-region and the regions subject to the fall of snow; (2) a Race map, distinguishing eight races, and showing likewise a large tract of country, especially towards the territory of the Amīr of Kashgar, which is altogether uninhabited; (3) a Language map, showing the districts where Tibetan, Dard, Kashmiri, Pahári and Chibhāli or Dogrā are spoken; (4) a Faith map, showing the territories of Bhuddists, Hindus, Sikhs and Muhammadans; and (5) a Political map, showing the main roads of commerce, in addition to the political boundaries. There are, in addition, a set of diagrams, and a number of very effective photographs, reproduced by Mr. Woodbury's process. We regret very much that Mr. Drew should not have ventured upon adding a geological map to the liberal set of illustrations with which he has presented us. We are quite aware that a map of this kind would have to be conjectural in a certain measure, but its very appearance would have incited to further research, and would have drawn attention to points yet to be determined by future explorers. Indeed, considering that Mr. Drew is a geologist himself, we should have expected that geology would have occupied a much more prominent place in a work designed to give an account of his labours in the Himalayas. He furnishes us with several capital illustrations of geological agency; he accounts in a manner, leaving no room for doubt, for the occasional floods of the Indus, which he ascribes to landslips on a gigantic scale, which dam up the river, until the pent-up waters force a way through the obstructive barrier, and sweeping down with irresistible violence, carry destruction in their path; he supplies several capital illustrations of glacier action, but he fails to render a connected account of the geological features of these regions. We trust Mr. Drew will make good this omission on some future occasion.

When we turn to questions purely geographical or to the accounts given of the various tribes and castes and their customs, we are able to speak of the author's work in terms of unqualified praise. He has intentionally forborne to interweave with his narrative the accounts furnished by his predecessors. By doing so, certain portions of his work may be less complete than if he had been more of a compiler, but it has gained in freshness what it has lost in completeness, and is certainly more interesting to read than a compilation would have been. Those amongst our readers who desire to gain some trustworthy information respecting one of the most important tributary states of our Indian Empire and one of the most gigantic Alpine regions of the world, may refer to Mr. Drew's book with confidence. They will find it a very store-house of information.

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A PEEP AT MEXICO.*

Mr. J. L. Geiger, a London merchant, has spent a holiday in the United States and Mexico, and presents us with the results of his experiences in an entertaining and at the same time instructive volume. The author left San Francisco on the 4th of December, 1873, on board the 'Montana,' paid a flying visit to the principal towns along the Pacific sea-board, and then started from Manzanillo for a journey across the whole of the Republic, in the course of which he visited Colima, Zapotlan, Gauadalajara, Guanajuato, and the capital of the country, finally reaching the Mexican Gulf at Vera Cruz. Introductions to some of the leading merchants of the country afforded him an opportunity of becoming acquainted with the condition of the country, and his remarks on social and political questions therefore carry more weight than if they had been made by a mere tourist, rapidly traversing a country, and limited in his intercourse to hotel-keepers, waiters, and conductors. Mr. Geiger is hopeful of the future of Mexico, and believes in the permanency of the existing Republic institutions.

"The task of the Liberals has been gigantic, and whatever may be the faults of the Mexicans—and they are numerous—this great honour must be conceded them, that they have been in the van of the great contest of modern times—the fight of liberty against Ultramontanism. The curse of Spain was left indelibly branded upon her colony even when its independence was accomplished: the population was thoroughly priest-ridden, fanatic, ignorant, and ever ready to rise against the power in authority; the clergy corrupt, debased, and utterly criminal, shrinking from no deed, however vile, when an iota of their power was endangered. What wonder that revolutions were easily fomented, and that hordes could be rallied by the thousand, eager to rush madly, with crucifix in hand, against any champion of emancipation of the priest."

* *A Peep at Mexico*: Narrative of a Journey across the Republic from the Pacific to the Gulf in December 1873 and January 1874. By John Lewis Geiger, F.R.G.S. London (Trübner & Co.)

To Juarez and the Laws of Reform promulgated by him in July 1859, which established religious liberty, Mr. Geiger traces the progress which has been made since those dark times, ever disturbed by civil war. The intervention of France in favour of priestly rule he looks upon as utterly unjustifiable, and Maximilian's execution, though regretable on humane grounds, he considers to have taken place in accordance with Law, and after a fair trial. The Mexican Government has been vigorous since then in carrying the reformsinto practice.

"No monk, no nun, no Jesuit as such, is permitted to reside in the Republic; no priest is allowed to range the streets in the garb of his order; cloisters and monasteries have been converted into reformatories and schools; and the levying of boxes for clerical purposes is prohibited. The masses are being afforded the means of instruction, and the aim of the Government is to rescue the youth of the land from the hands of the priest, and entrust him to those of the schoolmaster."

Incisive measures of reform, such as these, naturally rouse the opposition of the priests, backed by the uneducated masses; but Mr. Geiger considers that the Liberal party is sufficiently strong to uphold them, until they have firmly taken root.

Mr. Geiger's narrative is brisk and entertaining throughout, it is illustrated moreover by forty capital photographs, most of them taken by the author himself, and by four maps.

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THE SEARCH FOR SIR JOHN FRANKLIN, from the Journal of *Allen Young, Esq., F.R.G.S.* (Griffin & Co., Portsea, 1875).

WE are glad that Mr. Griffin has obtained permission to reprint Captain Allen Young's very interesting journal of the voyage of the 'Fox,' which originally appeared in the *Cornhill Magazine*. It is a pleasantly written account of a very memorable expedition, and those (we trust there will be many of them) who read the gallant seaman's well-told tale, cannot fail to feel regret that it is so brief when they come to the last page.

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MODERN NAVAL HYGIENE. By *Dr. Leroy Mericourt*, translated from the French by *John Buckley, Staff-Surgeon, H.M.S. 'Endymion.'* (Griffin & Co., Portsea, 1875).

THERE cannot be any doubt that Dr. Buckley has done very useful service to the navy in giving this valuable little work an English dress. In bringing its various hints and suggestions to the notice of commanding officers and surgeons of Her Majesty's ships, he has helped to strengthen their hands in their joint efforts to secure the physical well-being of the seamen committed to their charge.

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HYDRAULIC MANUAL. By *Lowis D'A. Jackson, A.I.C.E.* London (W. H. Allen & Co.), 1875.

THIS is a collection of formulæ, tables, statistics, and general information about water-supply works, comprising canal, irrigation tank and reservoir construction; also the methods of gauging the discharge of water through channels, measurement of river beds, &c. It is written with special reference to India, and is intended as a manual for the use of those who may be engaged in such works in that country; while in a second part it contains a copious collection of facts connected with works already executed; also rainfall and other meteorological statistics.

The space at our disposal will not admit of giving more than a sketch of the contents, and directing attention to the great variety of subjects comprehended in the work. It will doubtless prove of great utility to the practical hydraulic engineer, especially in India, or other countries where works of reference on the subject are not readily available, as it aims at serving as a compendium of all the information required.

The first chapter is devoted to the various formulæ required for determining the flow of water; of these we can only say that the uniform system of notation adopted is a great advantage. Some of the formulæ evidently require press corrections, see formulæ (1), page 44. We also do not find in the table of notation what is represented by S. & G. in the same formulæ. Numerical examples to illustrate the use of the formulæ would probably have been appreciated by the less scientific student.

In the second chapter we have practical instructions for measuring the discharge of streams, both great and small, with instructive practical examples from the great rivers of America; the third chapter dealing more especially with irrigation questions, entering at length into the subjects of modules, or water meters, and financial results in the principal countries where irrigation is largely adopted.

The first part concludes with sundry useful tables, and we suggest in a future edition a more complete reference should be furnished as well as the authority for the material in each table, where it is not now afforded.

To Indian engineers especially we imagine the second part will be found the most valuable. It gives complete accounts of the cost, revenue, and general principles of construction of the chief works of irrigation and water storage hitherto carried out in India. The author appears to have had difficulty in obtaining information about the Bombay Presidency, but does not explain why. The book concludes with some useful meteorological tables, from observations from various parts of India, extending over many years.

We would express our opinion in conclusion, that either the old or the new system of spelling Indian words should be adhered to throughout. For instance, the non-Indian reader would hardly recognise Roorkee and Rurkhi as the same place, and we have the familiar coin spelt rupee and rupi on the same page.

Cartography.

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Handtke's Map of European Turkey.*

MR. FLEMMING of Glogau has just published the four first sheets of a map of European Turkey, which is to be completed in twenty sheets. The sheets published embrace the whole of Bosnia, the Herzegovina and Montenegro, together with the larger portion of Servia, and, if trustworthy, would prove exceedingly useful at a time when the eyes of Europe are directed upon that portion of the Turkish empire. Scheda's map, (1:864,000) published in 1869, and the new edition of Dr. Kiepert's map (1:1,000,000) published in 1870, no doubt appeased the appetite for Turkish maps in a large measure, but the former is very incorrect and defective, the latter, though one of the most careful compilations of its justly renowned author, is on so small a scale, that a new map, nearly double its scale, and engraved in a superior style, as the map before us is, would have stood a good chance of supplanting it. Unfortunately this new map cannot compare with Kiepert's on the score of accuracy, and though it contains more names, it is less correct, in its general features, than the map which preceded it. This is all the more surprising, as Kiepert's map is accompanied by explanatory notes, enumerating the

* F. Handtke, Specialkarte der Europaeischen Türkei, 1:600,000. Glogau, 1875. Sheets 7, 8, 11 and 12, 1s. 6d. each.

materials used, and subjecting them to an incisive criticism. Surely Mr. Handtke cannot have read these notes, nor the criticisms which appeared on the publication of Scheda's map, or he would not have repeated errors which are pointed out there. Dr. Kiepert, not content with criticizing the work of others and the materials available when he constructed his map, has criticized his own work likewise. He has pointed out those portions of it which are still defective and subject to future correction, and enumerates various authorities, whose information he was not fully able to embody in his map, because of the progress already made by the engravers. In fact, he has, in a most unselfish manner, smoothed the way to any one desirous of succeeding him as a compiler of a map of European Turkey. Dr. Handtke has not chosen to avail himself of the information thus freely offered, and his work suffers accordingly. As an instance of the differences existing between the two maps we may mention that the distance from the mouth of the Drin to Zvornik is 35 geographical miles according to Kiepert, 27 according to Handtke; the distance from Zvornik to Vishegrad is 40 miles according to the former, 52 according to the latter. These differences are too considerable to be allowed to pass without comment, and unless Mr. Handtke is able to prove that Dr. Kiepert, with whom we agree, is wrong in the conclusions he has arrived at on this point, after carefully weighing every available evidence, he must pardon us if we reject his work as untrustworthy. At the same time we are willing to admit that his map contains numerous names in addition to those to be found either on Kiepert's or Scheda's maps, and that the Austrian territories, as far as shown, have been carefully reduced from the latest government surveys.

A Railway Map of Scandinavia.*

Mr. AUGUST HAHR, the well-known Swedish cartographer, has published a railway map of the three Scandinavian kingdoms. Three classes of railways are distinguished, viz., state lines, private narrow gauge lines, and private broad gauge lines. Railways open for traffic, in course of construction, or merely projected, are likewise shown. In addition to railways, the map contains ample topographical details. Roads, towns, villages, manor-houses, iron works, mines, &c., are shown; and it therefore meets the wants of ordinary tourists.

Log Book.

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The 'Pandora.'—Captain Allen Young had reached Ivigtot on the coast of Greenland, where the cryolite mine is situated (lat. 61° 34′ N.), on the 30th of July. For twelve days after that date the 'Valorous' was in Holsteinborg harbour, and the 'Pandora' probably passed that place, on her way north, in this interval. She would be at Godhavn in the first week of August, would find a supply of coals ready for her in the Waigat, and would be in good time for passing through Melville Bay.

Paris Geographical Congress.—The prizes awarded by the International Juries at the Paris Geographical Exhibition were far more numerous than was expected. According to the regulations published on the 1st of July, each of the seven groups was assigned 8 1st class medals, 16 2nd class medals and 16 diplômes d'honneur (Honourable Mention). There were in addition 42 medals and 28 diplômes for the whole of the groups, the total number of awards available being thus: 70 1st class medals, 140 2nd class medals, 140 diplômes, and an indefinite number of Letters of Distinction. The juries actually awarded 69 Letters of Distinction, 123 1st class medals, 147 2nd class medals, and 165 diplômes. These 503 prizes were distributed amongst less than 1000 exhibitors in the following manner:—

		Letters of Distinction.	1st Class Medals.	2nd Class Medals.	Diplomas.
I.	Group (Mathem. Geo.)	17	17	17	22
II.	,, (Hydrography.)	6	11	15	18
III.	,, (Physical Geo.)	14	30	31	16
IV.	,, (History of Geo.)	8	14	18	18
V.	,, (Statistics.)	5	24	26	28
VI.	,, (Didactical Geo.)	9	17	28	42
VII.	,, (Voyages & Travels)	10	10	12	21

The following is a summary according to countries:—

	Letters of Distinction.	1st Class Medals.	2nd Class Medals.	Diplomas.	Total.
France	10	28	43	75	156
Russia	12	17	21	14	64
Austro-Hungary	6	20	16	8	50
Germany	3	9	3	10	25
Sweden	3	11	5	6	24
Italy	3	8	7	7	25
Netherlands	5	2	10	7	24
England	7	3	4	8	22
Switzerland	4	5	7	4	20
Belgium	2	4	4	4	14
Denmark	2	4	7	1	14
Norway	3	2	2	7	14
Portugal	1	4	5	3	13
Spain	3	1	6	3	13
United States	2	3	2	—	7
Turkey	1	—	2	2	5
Argentine Republic	1	1	—	1	3
Luxemburg	—	—	1	1	2
Chili	—	—	1	1	2
Japan	—	1	—	1	2
Brazils	—	—	—	1	1
Columbia	—	—	1	—	1
Egypt	—	—	—	1	1
Hawai	1	—	—	—	1
TOTAL	69	123	147	165	503

In addition to the above, Letters of Distinction were awarded to all the Alpine and Tourist Clubs, and the "Executive Committee" voted a special Letter of Distinction to the authorities of the Cambodian Museum, at Compiègne, and gold medals to MM. Payer and Weyprecht.

Khokand.—The insurrection in Khokand, which led to the flight of Kvodoyar, the khan raised into power and supported by Russia, may possibly lead to an extension of Russian territory. The rebels, incited by their priests, crossed the frontier and surrounded the Russian towns of Khojent and Uratube. The garrisons, however, made a stout defence, and enabled the Russian authorities to hasten to the relief of these places. Several skirmishes have been fought, and a battle of some importance took place under the walls of Makhram, a Khokand town on the Syr-Darya, where 30,000 enemies were defeated on the 3rd of September by the Russians led on by General Golovachef. The Khokandis lost 39 guns. General Golovachef, having received reinforcements continued his advance upon Khokand, and occupied that town on the 16th of September.

* Generalkarta öfver Jernvägs Kommunikationer inom Sverège, Norge och Danmark, sammandragen af A. Hahr. Scale 1:1,000,000, 6 sheets. Stockholm, 1875.

Colonel Gordon.—Colonel Gordon is progressing steadily in his systematic plans for exploring the African lake region. He had passed several vessels above the cataracts in latitude 4° 38′ N. after great labour; and he expects to be able to form a line of river stations, by passing the cataracts of Makédo, and keeping vessels on the long intervals of navigable water between each cataract.

Abyssinia is still a prey to anarchy. Tigre and the eastern provinces are under the government of Kasa, who was crowned some years ago, and goes by the name of Johannes. His efforts to gain a footing in Amhara and in the southern provinces, including Shoa, have always proved abortive. Some time ago, when Kasa had taken the field against Menelek, king of Shoa, a nephew of the late king Theodoros, named Lej Ubié, placed himself at the head of the discontented parties, and rapidly gained possession of Dembea, Koara, Bagemder, Wogara, and other provinces of Abyssinia.

German African Society.—The réports from the expedition despatched by this Society to the West Coast of Africa are not as favourable as could be desired. Dr. Güssfeldt, having collected a large body of carriers, left Chinchoxo in May last, but sickness amongst the carriers compelled him to return to the coast. The station, established at a considerable expense, will be abandoned, and the members of the expedition are on their way back to Europe. Dr. Güssfeldt has already reached Berlin. The second detachment, commanded by Captain von Homayer, appears to have met with greater success, though its leader has been compelled to resign the command on account of illness, and is on his way back to Europe. Dr. Pogge, Dr. Lasaulx and Lieut. Lux, are reported to have reached Kasanje in the company of an ivory-dealer, named Saturnino, and are now on the road to the capital of the Matiamvo. They propose thence to proceed to Lucenda. Dr. Lenz, who is on the Ogowé, has again left for the interior.

Ecuador.—The little South American Republic of the Equator, the old Spanish Captain-Generalcy of Quito, is, geographically, a very interesting region, containing many unmeasured mountain peaks and wide tracts of unexplored forest. It is familiar to the general reader through the charming writings of Humboldt, and is memorable, in the annals of science, from the measurement of an arc by Condamine and the Ulloas. For the last fifteen years this little Republic has groaned under a despotism akin to that endured by Paraguay under Dr. Francia. The despot of the Equator, Dr. Don Gabriel Garcia Moreno, was a man of considerable ability, but a fanatical bigot of the most retrograde kind. He stamped out every sign of freedom, and filled the unhappy country with armies of greedy Jesuits, monks, and nuns. It is true that he constructed some good roads, and executed other public works; but he failed as a financier, and while neglecting to pay any dividend on the foreign debt of the country, he sent the Pope an annual present of $20,000.

On the 6th of August President Garcia Moreno was assassinated by a Columbian named Rayo, in the corridor of the Public Treasury at Quito. The Vice-President, Don Manuel Gomez de la Torre, succeeds according to law; but there are sure to be disturbances, and if the Jesuits and foreign monks are wise they will take their passages in the first steamer.

We trust that the removal of this incubus may lead to a better state of things in Ecuador. It is impossible not to feel hope for a country which produced such men as General Rocafuerte and the poet Olmedo in a former generation; and which now boasts of a patriot such as Juan Carbo, and a thinker like Juan Leon Mera, whose work on the literature of Quito we reviewed at p. 350 of the number of *Ocean Highways* for February 1873.

Obituary.—DR. OSCAR PESCHEL, Professor of Geography at the University of Leipzig, died on the 31st of August, after a protracted illness and much suffering. The deceased was born at Dresden, on the 17th of March, 1826. He studied law, but at an early age turned his attention to journalism, and for a number of years was sub-editor of the *Allgemeine Zeitung*, one of the most respected German newspapers. On the death of Dr. Wiedemann, he was appointed editor of the *Ausland*, which attained a high degree of popularity under his able management. Dr. Peschel was a man of great learning and original thought. In addition to numerous geographical papers published by him in the *Ausland*, most of them bearing upon historical and physical geography, we are indebted to him for a *History of Geography*, a *History of the Age of Great Discoveries*, *Problems of Geography*, and a work on *Mankind*. The last has recently been translated into English.

DR. KARL ANDREE, editor of the *Globus*, died on the 10th of August at Wildungen, aged 67. He was born at Brunswick, on the 30th of October, 1808, and studied at Jena, where he became one of the most enthusiastic members of the "Burschenschaft." His political conduct had made him "impossible" as a university professor, and he turned his attention to journalism. In 1838 he became editor of the *Mainzer Zeitung*, and subsequently he edited the *Oberdeutsche*, the *Kolnische*, the *Bremer*, and the *Deutsche Reichs-Zeitung*. In 1849 he retired from journalism in order to devote the whole of his time to geographical studies. The first result of his leisure consisted in a work on America (Brunswick, 1850), and many of his subsequent publications had reference to that continent and to the question of emigration. In 1863 he published a *Commercial Geography*, and since 1861 he has edited the *Globus*, a geographical periodical. Dr. Andree was a man of great research and of indefatigable industry, an elegant writer, and a man of strong convictions. He has been succeeded in the editorship of the *Globus* by his son, Dr. Richard Andree.

Correspondence.

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MR. SKERTCHLY ON THE OGOWE.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

SIR,—I am sorry to find that Mr. Skertchly has such a short memory on some subjects, whilst it appears to be so good on other matters. Of course it would scarcely be polite to contradict him, in the face of his assertion that I gave him *no* information respecting the Ogowé. I will therefore simply state that I have the most distinct recollection of conversing with him about that river,

and of informing him that I had heard, from natives of the Mlenga and other tribes, of a mountain which was said to throw out smoke. I had previously, in 1866, communicated the same information to the Royal Geographical Society, and was then under the impression that an active volcano existed near the Ogowé; but in January 1873, when I saw the mountain in question, called Otombi or Motombi, I found that I had misunderstood the natives, as it is certainly not an *active* volcano, although it may be an extinct one: however, whether I gave Mr. Skertchly such information or not, is a matter of no importance.

The name Oblimba is certainly unknown anywhere in the vicinity of Gaboon; and I was not before aware that Mr. Skertchly, during his first excursions in the interior, could by any possibility have gone so far to the "eastward of the high land wherein the river Rembwé takes its rise," as to have been at all near the route "to the Congo mouth;" and I think it would astonish anyone knowing the country, and the nature of Mr. Skertchly's excursions, to learn that he had fallen in with anyone, whether of "Arab descent" or otherwise, who was making a journey with "slaves and ivory" from such a quarter to the Congo, as that river is entirely unknown to any of the inhabitants of the interior immediately eastward of the Rembwé.

"Finally as to the Arabs," Mr. Skertchly must have been more fortunate than anyone resident in the Gaboon country for a much longer period than he professes to have been therein, if he ever encountered there either "Arabs" or "men of Arab descent;" as I can affirm without fear of contradiction, and can appeal to persons now resident in England as to the truth of my assertion, that the only two men who occasionally made the journey between the Gaboon and the Ogowé, and who resided more than a mile from my factory, and not "within a few yards" thereof, were *not* Arabs, but simply negroes from the Senegal, named respectively Kerno-Mahmadon Seydon, and N'Diaye or Njaï; the former of whom is still alive and resident in Gaboon, whilst the latter lost his life some three years ago by an explosion of gunpowder in his canoe, during a trading trip up the Ogowé. Therefore, I think I am justified in saying that either Mr. Skertchly's memory or his imagination has misled him, as I am confident that neither he nor anyone else ever heard of Arabs in Gaboon, by *report*, much less *saw* two of them "within a few yards of my factory" at that place. I am writing by the 'Monrosia,' on the 18th inst., and shall not fail to apply to residents at Gaboon as to the correctness of my statements, which, moreover, can be confirmed by Messrs Holt and others now in England.—I am, sir, yours faithfully,

R. B. W. Walker.

To the Editor of the "Geographical Magazine.

Sir,—Reading to-day Mr. Major's account of the voyages of the Brothers Zeno, I was struck with the passages at pp. xxviii and xxxiii relative to the conflict that Nicolo relates as having taken place between the inhabitants of Stromoe, Faërœ Islands, and Zichmni.

In 1872 I spent more than six weeks in those islands, visiting each one, with the exception of Fugloe, the most northern (on account of bad weather). On one occasion walking from Kalbak fiord to Thorshavn, and not far from where the Norderdahl track unites, my guide showed me a stone, and volunteered the statement that it marked the spot where the inhabitants of Thorshavn had given battle to an enemy. Further information I could not procure from him, only that the battle took place a long time ago.

H. W. Feilden.

H.M.S. 'Alert,' off Cape Farewell.
25th June, 1875.

Proceedings of Geographical Societies.

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BRITISH ASSOCIATION.

Section E.

Thursday, August 26th, 1875.

After the reading of the President's Address, which appeared *in extenso* in our last number, Captain H. H. Toynbee, read a paper "On the Region of the Equatorial Calms of the Atlantic." He exhibited and explained a series of diagrams which he had prepared in co-ordinating a series of about 70,000 observations, made by various naval commanders on the winds, currents, temperatures, &c., of the equatorial zone of the Atlantic. These diagrams may be said to give the navigator a monthly picture of the doldrums, clearly showing him how, in some months, they are wedge-shaped (as remarked by the late Commodore Maury), and enabling him to select the best route across the equator. They also illustrate the action of both air and water when meeting, as is constantly the case with the two trade winds; showing also how the air as well as water seems to eddy round a point of land from which the main stream is running. The specific gravity of the currents due to the N.E. and S.E. trades, as well as that of the Guinea currents, is also given. The district is the birthplace of many West Indian hurricanes, and the place in which one originated was pointed out on the diagram for August, it having been afterwards traced to the island of St. Thomas. Besides many other allusions to remarkable and unsettled weather, reference was made to two earthquakes which were experienced by ships in the district. It was explained that the paper was a *résumé* of a larger work shortly to be published by the Meteorological Office.

Dr. Carpenter called attention to the remarkable fact that in the equatorial Atlantic, even in the month of August, they had no higher temperature than was often found to prevail in the Mediterranean. The temperature in the equatorial waters was 79°; whereas in the Mediterranean it was often higher.

The President said the diagrams and figures were wonderfully harmonious and extremely accurate. The results were really very valuable.

Captain Toynbee pointed out, in reply to Dr. Carpenter, that August was the depth of winter at the equator, and that that was the period when the lowest temperature would prevail. In April the temperature would be higher.

Dr. Carpenter.—I referred to the general fact that the temperature of the water there never exceeds 80 degrees in any season.

Captain Toynbee said the reason of the cold water seemed to be the large amount of water thrown up by the southern winter towards the equator, and the cold there was the cause of many of the westerly gales.

The Cruise of the 'Challenger.'

Mr. James Croll, read a paper "On the 'Challenger's' Crucial Test of the Wind and Gravitation Theories of Oceanic Circulation." The researches of the 'Challenger' brought to light the striking fact that the general surface of the North Atlantic to be in equilibrium must stand at a higher level than at the equator. The surface is lowest at the equator, and rises with a gentle slope to well nigh the latitude of England, a result which proved the physical impossibility in so far as the North Atlantic was concerned of any general interchange of equatorial and polar water due to gravitation. The results of the researches were all against the gravitation theory. The warm water was all in the North Atlantic, and little or none in the south—a condition of things the reverse of what ought to be according to that theory.

The thermal condition of the Southern Ocean, as ascertained by the 'Challenger,' appeared also irreconcilable with the gravitation theory, the very fact that a mass of water, 200 fathoms deep, extending over 15 degrees of latitude, remaining above water of three or four degrees higher temperature showed how little influence difference of temperature had in producing motion.

Dr. CARPENTER followed with his paper "On the bearings of Recent Observations on the Doctrine of Oceanic Circulation." He said he thought that nothing could be plainer than that there was a great system of horizontal circulation, more on the north than on the south of the equator. In the north that circulation was complicated by the fact that a large portion of the equatorial current goes into the Gulf of Mexico, and issues forth as the Gulf Stream. He felt convinced, however, that there was a large portion which never goes into the Gulf of Mexico at all. There was a large portion reflected from the West India Islands and the peninsula of Florida. He considered that this portion was the source of the thick layer of warm water referred to by Mr. Croll. They knew little or nothing of the great basins of water, but he had ventured to predict that it would be found that the temperature of the North Atlantic would be below 40 degrees. That was verified. He had also predicted that the lowest temperature would be found in the South Atlantic, and it had since been ascertained that the temperature in the South Atlantic was below 35 degrees. He could not account for the warmer water near the barrier of ice unless brought there by a force which draws it into the Polar area.

Sir WM. THOMSON urged that investigation should be made into the circumstances under which the cold and warm currents meet. He cordially pronounced in favour of the soundness of the views held by Dr. Carpenter.

Friday, August 27th.

THE PAMIR STEPPE.

THE first paper was by Colonel T. E. GORDON, a member of the scientific staff who accompanied Sir Douglas Forsyth on his late mission to Kashgar, "On the Exploration of the Pamir Steppe,"* which gave many valuable details of the observations on the central watersheds, &c., of Asia, the hot-springs, the lakes, and the waste lands.

The PRESIDENT pointed out that the Pamir Steppe was the centre point from which their observations of the geography of Central Asia could be most conveniently made. The energetic labours of the gentlemen of the exploration had thrown a great deal of light on the subject.

Sir RUTHERFORD ALCOCK said the paper ought to be carefully studied with map in hand. The tract of country was becoming every day now of greater importance from the advance of Russia, and it behoved them to thoroughly understand the geography of the region and what were the points of the greatest advantage for merchants and armies.

Sir H. RAWLINSON observed how much the Geographical Society appreciated the explanations of Colonel Gordon, who had demonstrated the inaccuracy of the old prophecy that the first time Cossack and Sepoy met would be on the field of battle. Colonel Gordon had not only crossed the intervening tract, but had passed over the Russian frontier. He agreed with what had been said with regard to the extension of commerce. It was that which had, in fact, stimulated the Government to make the explorations, and not with a view to any warlike enterprises. What they aimed at was the extension of the peaceful arts of commerce, and scientific and geographical knowledge.

Colonel MONTGOMERY, of the Trigonometrical Survey of India, followed on the map the routes of different explorers and the surveys made. There were still regions of which they knew nothing. They knew nothing of the Terek Pass, but his explorers were still trying to find a route through the great mountain ranges extending peak after peak for thousands of feet in height beyond the Mustagh Range.

Sir RUTHERFORD ALCOCK asked under what government were the natives of the region?

Sir H. RAWLINSON said they were quite independent. He wished to point out that, if a letter which had been received was correct, the Terek Pass was not so unknown as was supposed. It stated that the writer, on his way from Kokhand to Kashgar, had crossed the Terek Pass, and if that were so, he was one of the most wonderful of European travellers. The writer, a Belgian, rejoiced in the name of "Romulus Bonhomme."

THE TURKOMAN FRONTIER OF PERSIA.—THE OXUS.

Sir H. RAWLINSON gave a sketch, illustrated by maps, of an elaborate paper by Capt. the Hon. G. Napier, "On the Turkoman Frontier of Persia." The important position of Merv was descanted upon. The town itself was a mere collection of huts at present, but round it centred great political interest, because there could be no doubt the position was of the greatest importance. The points in dispute between the Russians and the Turkomans were pointed out, and the investigations of the Hon. G. Napier, who had zigzagged about along the Russian frontier and among the Turkomans, were valuable from several standpoints. The geographical interest centred in the tracing of the old bed of the Oxus, which was altogether different from that which the Russians were now taking such pains to explore. Capt. Napier had also thrown light on ancient geography, and when his discoveries were properly worked out they would throw great light on this part of Central Asia. He was also very accurate in fixing all the lines of route from the Caspian to the East; and Sir Henry pointed out the course which the Russians would take if they ever occupied the tract of country with which the paper dealt. He also pointed out that the Russians would have no difficulty in establishing through-water communication to the centre of Asia—to Turkistan on the one hand, and to the foot of the Hindoo Kush on the other.

A paper by Major H. WOOD, who accompanied the Russian expedition, "On the Probable Cause of the Change of Direction which has occurred in the Lower Course of the Oxus," by which its mouth has been directed from the Caspian to the Aral was next read. He attributed the change to abstraction of its waters for purposes of irrigation, especially in Khiva, where there was great waste of the water, owing to a defective system of irrigation. If the river had not been thus interfered with, it would have continued its course to the Caspian, but owing to the artificial means used to abstract the water, in course of time the sand banks which would be formed would prevent the Oxus flowing so far.

Dr. RAWLINSON said, with regard to Merv, although now a mere cluster of huts, twice in the history of the world it had been a place of great importance. First, when the Aryan race came down from its highland home it settled in Merv; and again, subsequent to the conquest of Alexander, Merv was a place of great importance, and was occupied by the Greeks. As to the course of the Oxus, it was said that if the Oxus had debouched where the Attrek now enters the Caspian in the time of the Parthians, it would explain much that was at present difficult to understand in the career of that people. What was understood as the seat of that nation, the mountainous districts on the south-east of the Caspian, was much too confined and poor a country to supply the vast resources in men and means which the Parthians displayed when they carried their conquering arms to the Mediterranean, and disputed the empire of the East with the Romans. But if in those

* See *Geographical Magazine* for July 1874, p. 139; also p. 257 of our last number.

times the Oxus debouched at the Attrek, and a vast tract of what was now sandy desert was then a well-irrigated, fertile, and populous region, forming part of the Parthian territory, the mystery would be explained.

The Sahara Depression.

General Sir Arthur Cotton next read a paper "On the Project for letting the Waters of the Atlantic into the El Juf Depression of the Western Sahara." He said one of the most remarkable signs of the times was the extraordinary interest now taken in the opening up of Africa. Timbuctoo was the central point of North-West Africa, and many years ago the project of a direct line of trade with Timbuctoo was entertained, although the possibility of letting in the sea to the depression did not seem to be entertained. The existence of the depression was, however, frequently noted, and there could be no doubt that at one time—though a great many years ago—the depression was an arm of the sea. He could not account otherwise for the encrustation of salt which was found in it. He pointed out the great traffic which might be carried on with the great masses in the interior, who wanted our manufactures, if the sea were restored to its former bed in the Sahara, and contradicted on authority the idea that the tribes of the desert were wild and savage; they could give in return for our goods gold, ivory, gums, and other rich products. Multitudes of men now unknown would be brought into trading relations with England if the sea were restored up nearly to Timbuctoo, and a canal cut from the Niger to meet the sea. He sketched the limits of the depression, which was 10 miles broad near the sea, and some parts of it were below even the level of the sea. He also commented on the remarkable fact of the absence of any watershed to the Niger at Timbuctoo. He thought the scheme of opening up Africa by means of restoring the Sahara depression to the sea was well worthy of careful consideration, and especially of England. A grander and more interesting subject could not be imagined; and after the small expedition had made an exploration, they would have to consider whether they should go to the expense of about 10,000*l.* to have a complete examination of the undertaking.

Mr. Galton said Timbuctoo was a place of no importance whatever. It was 1500 miles from the mouth of the Niger, and must be 1000 feet at least above the level of the sea. The making of this lake meant cutting a channel four times the size of the Volga, from an unknown distance, and, after all, to reach Timbuctoo.

Canon Tristram considered that the formation of the lake would require more water than man, by any known appliances, could pour into it. He rather liked the Sahara, and considered the project a rather revolutionary proceeding in physical geography.

Professor Hennessey said if the Sahara was flooded—if it were possible to flood it—the conclusion he arrived at was that it would not injure the climate of Europe, and that it would benefit the climate of Western Asia.

Dr. Brown said that for many years Timbuctoo was considered a central point of great importance.

Dr. Nachtigal, the well-known African traveller, also spoke favourably of Timbuctoo. As to its being 1000 feet above the sea, he pointed out that this was not unusual, as Lake Chad was 800 feet above the level of the sea.

General Cotton said that of Timbuctoo being an important commercial centre there was no doubt whatever, and near it there were great masses of population which were not now reached. As to the height of Timbuctoo, one traveller spoke of it as 700 feet and another spoke of it as 800 feet, and there was no reason to doubt it. There was no question of flooding the Sahara—only a small portion of it; and the question was whether they should go to a small expense to decide the practicability of the scheme?

Sir Henry Rawlinson said until they knew more about the levels it was useless to discuss the matter scientifically; but they must all feel gratified at the project, although some of them might question the feasibility. It was not fair to pooh-pooh the subject; and on behalf of the Geographical Society he said they should be happy to have some additional scientific information.

Monday, August 30th.

Lake Chad to the Upper Nile.

Dr. Nachtigal read a paper on an expedition from "Lake Chad to the Upper Nile." The expedition practically began in 1869, and the following year, after a very painful and dangerous journey, he arrived at Bornu. Travelling from this point with a band of Arab robbers, he escaped for a time further perils, and ultimately was enabled to trace the remarkable water system of the Chad Lake. The lake covers an area of about 10,500 square miles. Its form is that of an irregular triangle, the base of which extends from W.S.W. to E.N.E. Two-thirds of the interior are occupied by land, and on the central islands live the Budduma, on the east the Kuti, and the north-east the Kanembi. Dr. Nachtigal considers it a fact that the waters of this great lake are not due altogether to the rainfall or to the neighbouring streams, but that a great part of them come from a great distance. It was especially noticeable also that there was no outlet to the lake. Dr. Nachtigal mentioned, in conclusion, a variety of interesting details as to the character of the natives, and urged repeated expeditions to this part of Africa in order to open up the way to a peaceful and profitable commerce, and to the enlightenment of an interesting and energetic people.

Mr. Galton pointed out that Lake Chad was a very small lake, and yet it required a vast quantity of water to keep it from being dried up. He left this fact for the consideration of those who had heard General Cotton's paper on the proposal to inundate the depression in the Sahara. He only regretted that this paper had not been read immediately after General Cotton's.

The President asked if the reader of the paper knew sufficient of the country to the west of the depression which comes out of Lake Chad to say if there was any possible egress to the north or north-east?

Dr. Nachtigal said it was reported there was an egress.

Sir H. Rawlinson said apparently there was another lake to the north to receive the outflow from Lake Chad. He presumed whatever salt was brought down to the lake was lost by drying up and then re-flooding. That was how they explained its freshness. On behalf of the Geographical Section he wished to recognise the great services rendered by Dr. Nachtigal. He had succeeded where others had failed, and his great services had been recognised by all the nations of the Continent.

Lake Nyanza.

A communication was then read from Lieut. W. H. Chippendale "On the Journey beyond the Cataracts of the Upper Nile towards Lake Albert Nyanza." The party left Duffelé, about 7 miles above the cataract of the White Nile, on the 26th of February last. The first station on the route was Gaifi, which was left next day. Faloro was reached in two days, whence the party was escorted by a chief. The country was intersected with hills and glens, and was very picturesque. Some of the chiefs refused to visit the expedition, saying they had been pillaged and where ashamed to come. In Erraya the people were not timid, but thronged round the camp of the travellers. Leaving this place, the party passed through a country of high grass and low scrub trees. Owing to the height of the grass no observations could be made, but it was noticed that as usual there were very many watercourses. Some of the rivers were so full that great difficulty was experienced in crossing them. At one point, food failing, the chief and the porters wished to return, but this was not listened to. All the banks of the river were lined by gigantic tropical vegetation. The

majority of the natives were naked; a few wore skins of goats slung round their loins. They nearly all wear a ring through the upper lip, and the colour of the natives was very various—from black through all shades to coffee colour. The chief of the Koshi visited the party, who did not want to go into the interior, as a terrible scourge of smallpox was prevailing. The chief told them his territory extended as far as the shores of the lake, about three days' easy marching. He also informed them the river higher up split into two branches, which he seemed to regard as two rivers. The one he said came from Magungo and belonged to Kaba Rega; the other came from the great lake, and by it it is always possible to enter the lake. This tale about two distinct rivers they had heard before. Probably there was a large island at the entrance of the lake, which would account for the two rivers flowing from the same lake.

Sir H. RAWLINSON said the paper was of great interest, inasmuch as it was the only information they had of the district since Sir Samuel Baker penetrated the region. Taken in connection with that mission of Sir S. Baker, he must say the paper raised considerable doubts in his mind as to the lake, which was one of the geographical puzzles of the day. Livingstone's idea was that his great Lualaba flowed out of the lake into the Nile, but geographers had found that that was utterly impossible. It made them all the more anxious that Colonel Gordon should thoroughly explore the south-eastern and southern borders of the lake, and probably before the British Association met next year the mystery might be cleared up.

EXPLORATION OF THE AURES MOUNTAINS.

Colonel R. L. PLAYFAIR read a paper on the "Exploration of the Aurés Mountains," a comparatively unexplored range in North Africa. The paper gave a history of the region and the peoples by which it was from time to time occupied, extending back to the earliest times. The natives were clearly of European descent; many Latin words were used by them, and they kept the 25th of December as a feast-day. In the valleys between the mountains there were many rivers on the southern side. On the north side the slopes were more gradual. The natives of all classes lived in stone houses, and the district might be made a valuable wool-producing country. The women were of singular beauty, and never concealed their faces. There was a great extent of cedar forests, and lead was to be found in abundance. Roman remains were to be met with in all directions, and they indicated a high state of civilisation at the time the Romans made a lodgment in the region.

DACOTAH TERRITORY.

Colonel H. C. CARRINGTON, United States Army, read a paper "On Dacotah Territory." He observed that the geographical and physical features of this tract, which is being rapidly carved into several large states, each of nearly 100,000 square miles, were long neglected by the American people. The geography of Dacotah is now under a more careful revision, as troops have been sent to protect Indians from the white encroachment, and examine the country. *Mauvais terres*, or bad lands, constitute the larger portion of the surface, while the valleys that fringe the rivers are often of matchless fertility. Lake De Smedt is bordered by excoriæ and volcanic *débris*, and its water is akaline and useless. Almost in the centre of the territory is the region of the Black Hills, an exceptional group of peaks and ranges, surrounded on all sides by bad lands. Upon the completion of the Pacific railroad a compromise was made with the hostile Indians, the Big Horn country was abandoned, and its rich valleys, as well as the country of the Black Hills, were given to the Indians for free occupancy. These hills are drained by the forks of the Big Cheyenne River. Within this encircling group or mountain chain is embraced all of the new Eldorado which is now challenging the aggression of adventurers. The Yellowstone River, flowing from the Yellowstone Lake, and the marvellous volcanic region adjoining, is a large tributary of the Missouri. The country is fine for barley, but too cold for corn. There is no limit to the pine timber, but all other timber is scarce and hardly fit for fuel. Sage brush and cactus predominate, except in the valleys, and, independently of the questionable gold element, there is little to attract a worthy emigrant. No extensive deposits of ores have yet been found.

PHYSICAL GEOGRAPHY AND PRODUCTS OF SOUTH AFRICA.

Dr. J. C. BROWN read a paper on the above subject. He said that apparently the whole of South Africa had been upheaved in a mass, but differences of soil were indicated by the products—lignite, coal, copper, gold, rubies, and diamonds—which were found in different localities. Formerly forests prevailed to a greater extent than at present. The inhabitants were to a great extent pastoral, but the progress was tending towards agriculture, and labour was being attracted by the diamond and gold fields. Capital was increasing, railways were rapidly extending, and there was much water now escaping to the sea which in future no doubt would be utilised.

Tuesday, August 31st.

A crowded meeting assembled to hear read the report of Mr. CLEMENTS MARKHAM on the Progress of the Arctic Expedition. We would respectfully refer our readers to the second article, p. 292 of the present number for a full account of the progress of the expedition and the return voyage of the 'Valorous.'

Mr. KEITH JOHNSTON then gave an interesting account of his recent journeys in Paraguay, part of which appeared in our last number, p. 264, and will be found continued at page 308 of the present number.

The PRESIDENT said if gentlemen had read Mr. Keith Johnston's paper before speculating in the Paraguay loan, they would not have spent twopence instead of two millions in regard to a country in the deplorable condition of Paraguay.

TRADE ROUTES TO WESTERN CHINA.

A paper by Colonel YULE "On Trades Routes to Western China" was then read. The field with which the paper dealt was the region in which the great southern rampart of the Tibetan plateau, which in India was called the Himalaya, passing beyond 100° of east longitude, approached its eastern limit, whence it broke up into a vast radiation of terminal spurs which eventually sink into the great alluvial plains of China and Indo-China, or else run onward to the sea. Attention was briefly called to the different races occupying this region: the Chinese, the Shans, Singphos, Talains, and the Palaungs. From Tali towards the Burmese capital one chief road ran direct; the rest made westward for the nearest points of the Irawadi at and about Bhamo. The direct road was that by Thein-ni, formerly the seat of a considerable Shan principality. The paper further went into elaborate details of the geography of the regions.

Sir H. RAWLINSON said that the paper supplied most valuable information with regard to a region which, in view of a conflict with China, possessed great interest for Englishmen at the present moment.

GLACIERS OF THE WESTERN HIMALAYA.

Colonel MONTGOMERY gave a full description of the gigantic glacier system of the Himalaya Range, which reaches its greatest development in Baltistan, in North-western India. The paper was illustrated by a number of superb maps and pictorial views of glacier scenery. The glaciers gradually increase in size from east to west, and in the Mustagh range are in many cases more than 20 miles in length, the largest being Biafo, 34 miles long. The thickness of the ice was in some cases found to be 400 feet. The result of experiments showed that the general phenomena as to motion, &c., were identical with those of the glaciers of the Alps.

The business of the section was brought to a close on the reading of a paper by Mr. Delmar Morgan "On Prejevalsky's Journey through Mongolia," which will be found at p. 305 of our present number.

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PARIS GEOGRAPHICAL SOCIETY.

Bulletins for June and July.

M. Malte-Brun gives in the *Bulletin* for June a brief notice of the comparative state of our geographical knowledge of the earth's surface, illustrated by a map, in which the countries surveyed are coloured a deep red, lighter shades being used to denote lesser known countries, while *terræ incognitæ* are left white. Europe appears uniformly red, portions of Finland, Lapland and Turkey being alone unexplored. The lesser known regions of Asia comprise tracts of Northern Siberia, parts of Central Arabia, Baluchistan, Indo-China, Tibet, and Mongolia, while the unknown parts are some portions of Northern Arabia, Eastern and Great Tibet, and Eastern Siberia. In Africa, a vast region extending between Lakes Chad and Tanganyika and from the basin of the Bahr-el Ghazal to that of the Ogowé is still unknown, as well as parts of the Galla country. Parts of Northern America, the northern half of Labrador, Alaska, with the exception of the course of the Yukon and a few Islands, the interior of Greenland, and of the countries bordering Smith's Sound, are left uncoloured, as well as tracts of country contiguous to the sources of the Amazon and the Rio de la Plate, and in the interior of Patagonia and Tierra del Fuego, several portions of the Eastern Archipelago, notably the interior of New Guinea, and to a certain extent, that of Australia also. The Polar regions of course still offer the most extensive scope for exploration. The general aspect of the still unknown regions of the earth's surface appears to offer plenty of work for geographical science for many years to come.

The Mackenzie River and Arctic North America.

In the July *Bulletin* of the Paris Society, we are presented with a new and valuable map, by M. l'Abbé Petitot, of the course of the lower Mackenzie River and the country adjacent to the Great Bear and Great Slave Lakes. This region was traversed by the Abbé, while engaged on his missionary labours, during a period of eleven years, between 1862 and 1873, and his map shows the value of his researches, being most carefully elaborated and covered with a perfect network of his own routes.

As we have previously mentioned,* an interesting paper on the subject was read by M. l'Abbé before the Society, on the 20th of January last. The Abbé is evidently jealous of his country's renown, and he did not fail in the course of his lecture to set forth the deeds of Frenchmen and French Canadians, coupled with frequent expressions of regret, that this field of enterprise had been snatched from their country's grasp.

M. l'Abbé commenced his paper by giving a short *resumé* of the earliest explorations of the French and English in this region, starting with Champlain's expedition to the Ottawa and Mattawan Rivers in 1615.

In speaking of the discovery of the Great Slave Lake by Peter Pond, in 1780, he mentioned the interesting fact that in the course of his travels he had met with a French half-bred, named Francois Beaulieu, who subsequently died in 1872, at the age of about 100 years, and who remembered well the advent of the first Europeans, who must have been either Peter Pond, in 1780, or Sir Alexander Mackenzie, in 1789.

M. Petitot also enumerated the names of several travellers, who by their researches in various parts of this region, had contributed geographical information, which is not to be found on existing maps. Among these Mr. Bell, about the year 1840, was the first European to penetrate into Alaska, from the Arctic side of the Rocky Mountains, a journey subsequently repeated by M. Petitot and others; Messrs. M'Dougall and M'Donald descended the Yukon to its mouth in Behrings Sea, between 1864 and 1870; Mr. Campbell explored, about 1848 or 1850, the Pelly and Lewis Rivers and the sources of the Yukon, and built Forts Francis and Pelly. His discoveries are only roughly indicated on the best maps. In 1859, Roderick Macfarlane discovered to the north-west of Fort Good Hope, of which he had charge, a river, running parallel to the Mackenzie, which he named Anderson River, and a few years after, another stream still further eastward, which M. Petitot has named after its discoverer. Lastly, in 1862 or 1863, M. Arnott traversed in an Indian bark canoe, the intermediate region lying between the Mackenzie and Anderson Rivers, and 67° 30′ and 68° 30′ N. latitude.

The Abbé then proceeded to describe his map, which embraces the basin comprised between the Coppermine River and the Rocky Mountains to the east and west, and the Great Slave Lake and the Frozen Ocean to the south and north. Owing to the great difficulties of carriage, he was unable to obtain any instruments but a watch and a compass. This obliged him to rely on Franklin's fixed points, and he has accordingly refrained from modifying to any great extent the general direction of the Mackenzie River, the Rocky Mountains, the configuration of the Arctic shore, and the position of the Great Bear and Slave Lakes. He arrived at a rough idea of his longitude by calculating the difference between the time of the sun's rising and setting with that at Fort Good Hope, which he knew to be 5h. 8m. behind Greenwich. For heights he has relied mainly on those observed by Richardson and Franklin, adding his own eye-measurements of the mountains which rise from the basin of the Mackenzie to theirs taken at various points along the plain through which the river flows. M. Petitot remarked that the greater part of the country traversed by him was composed of vast dreary plains of frozen wastes, bleaker even than those of Siberia, and of wild and stunted forests such as are only to be seen in extreme latitudes, but that he nevertheless learnt to conceive an affection for the country.

The results of M. Petitot's labours may be summed up as follows:—1. A survey of a large portion of the country between the Great Slave Lake and Great Bear Lake to the south and north, and Franklin's route in 1810 and the Mackenzie to the east and west, in the course of which several discoveries were made, one being the examination of Lake de la Martre, on the 63rd parallel of latitude, the existence of which Franklin had learnt from natives, but had been unable to visit. 2. A detailed survey of the mountain system on the right bank of the Mackenzie. 3. An examination of the topographical features of the country between the Great Bear Lake, the Mackenzie River, and the Arctic Ocean. This region, which was explored in every direction by the Abbé at intervals during a period of ten years, has been most completely surveyed. He satisfied himself that the river, the mouth of which was crossed by Richardson on the 10th August, 1848, was not the Anderson, but that one further east which he had called Macfarlane River. He examined also Esquimaux Lake, the existence of which had been announced by Franklin, but subsequently contested by Richardson. 4. From 1865 to 1873 M. Petitot traversed, in company with several Indians, the country to the east and north-east of Fort Good Hope, visiting the Great Bear Lake by different tracks no less than eight different times. The steppe between the Anderson and Macfarlane Rivers is covered with lakes, the outlets of which are, in the Abbé's opinion, indubitably subterranean. In 1869, in crossing the Great Bear Lake, in the month of May, Père Petitot fell through some crevasses in the ice on no less than three occasions, narrowly escaping death by drowning each time, while soon after that on Bear River, the stream being encumbered with ice

* *Geographical Magazine* for July, 1875, p. 222.

at the time, his canoe capsized and he and an Indian owed their lives to being fortunately thrown on a sandbank. In 1870 he visited Fort Yukon, which is situated close to the Porcupine River, the northern tributary of the Yukon. The return journey was made in company with some Esquimaux who followed the Abbé as far as his residence at Good Hope. 5. A thorough exploration of the course of the Mackenzie made in the course of ten journeys between the Great Slave Lake and Fort Good Hope, eight between the last-named place and the mouth of the Mackenzie, and twenty-two between Forts Good Hope and Norman. Without venturing to take away from Sir Alexander Mackenzie the honour of having discovered the stream named after him, M. Petitot ascertained that various localities had received French names, presumably from the French half-breeds settled in the country, while the Mackenzie itself is better known under the name of *La Grande Rivière* than any other. 6. A few modifications have been introduced in the configuration of the Great Slave and Bear Lakes, the recesses and bays of which have been all carefully explored, some for the first time. 7. The lower course of the Peel River of Franklin has been rectified by M. Petitot, who has ascertained that one channel joins the Mackenzie, while the other debouches into the Arctic Ocean. It was this latter one that Franklin ascended under the impression that he was ascending the Mackenzie. 9. The last of M. Petitot's achievements has been the placing on record the native names of all the places visited, and the giving of new names to such localities as he considered he had the right to name.

In a forthcoming number the Abbé promises to give a more detailed account of the geography of the country.

JOURNEY IN THE LISSU COUNTRY, WESTERN CHINA.

THE Abbé Desgodins communicates an account of a journey made by M. Dubernard, a brother missionary, with the object of conciliating some savage tribes named Lissu, who had made a raid on the inhabitants of Tse-ko, where some of the fathers resided. M. Dubernard left Tse-ko, which is situated on the right bank of the Lang-tsang-kiang, eight days south of Yerkalo, accompanied by five or six people who were acquainted with the Lissu. He had first to strike out to the north-west in order to pass a spur of the mountain-chain separating the Lu-tse-kiang from the Lan-tsan-kiang. On reaching the other side the descent was rapid, and for two hours they traversed a remarkably dense virgin forest, the vegetation of which was very luxurious and the *detritus* considerable, while the slopes above were clothed with extensive pastures. The second day the summit of the water-parting between the two rivers was reached, this being the boundary between Yunnan Proper and the country of the Lu-tse or Anongs, who are ruled by the lama of Cha-mu-tong, a dependant of Wesi. Père Dubernard was struck with the capabilities of the valleys, and could not help regretting that they were devoted to no better purpose than hunting-grounds for antelopes, bears, musk-goats, and foxes. On the third day a long valley, running north-east and south-west, was reached, and towards the close of the day the travellers were hospitably received at a village called Bardang by the lama of the district, his example being followed by the chiefs of all the villages passed, who brought out presents of food and game. At Mand Sang the chief had orders from the lama to offer his services as interpreter to the party. On the fifth day Guie-si was reached, a large village situated on the Lu-tse-kiang, and whose inhabitants cultivate wheat, maize, millet, and rice. The general direction of the Lu-tse is here south-westerly, and Père Dubernard followed its course to Yu-ra-gan, and thence to Taso, two days further south. The Lyssus received him in a friendly spirit, but refused to release their prisoners without a ransom. They agreed, however, to desist from raids in his direction for the future. At Taso a lofty chain of mountains to the westward was pointed out to Père Dubernard as dividing the country of the Lu-tse and Lyssus from Bayul or Pagni, a district which the Lyssus often ravage. A lower chain separates the Terong or inhabitants of Bayul from tribes dependent on Ava.

The Lyssus are nominally subject to Chinese rule. But those on the Lan-tsan-kiang (especially those on the left bank) pay tribute, furnish fighting contingents, and are altogether more amenable than those on the Lu-tse-kiang, who only join military expeditions as a rule to gratify their love of plunder, and pay little or no tribute. Their intercourse with Chinese and Tibetans has not changed their savage nature, which still delights in raids on neighbouring tribes. Their method of signifying their intention of making war is by sending a wand with a feather, a piece of burnt wood, and a small fish attached to it. The feather means that they will come with the swiftness of the bird, the burnt wood that they will burn everything in their path, the fish that their enemies will be made food for the fishes. The mandarins, however, make out that the Lyssus have been exterminated, and accordingly only speak of them as Pagni, which is the name applied to a distinct tribe on the confines of Burma. The reason of this is that about 40 or 50 years ago the Lyssus rebelled, and committed great ravages along the Lan-tsan-kiang, so that their name is still held in great dread through Western China. They live on these excursions wholly by rapine, their arms on such occasions being a cross-bow, with poisoned arrows, a long sword, which they use with great skill, and a large oval shield. Although they bear a character for ferocity, Père Dubernard has been assured that those who have found means to ingratiate themselves with these savage tribes, have found them fair and well disposed in their dealings. Part of their time is spent in agriculture and part in hunting, the former employment being resorted to after burning down a large portion of forest for their operations. This practice is much in vogue in India as well. Prisoners taken in war are always made slaves, but there are no attendant hardships to this lot, as slaves are treated as members of a family, being resold only when they displease their masters. Polygamy exists but not polyandry. Gold is very abundant among the Lyssus of the Lu-tse-kiang, small gold balls being the recognized currency, and weighed in Chinese scales. The religion is pure fetishism, evil spirits being supposed to dwell in fountains, rocks, and forests, and being much dreaded.

The Abbé Desgodins promises to communicate to the Paris Society any further news of interest which he may receive from M. Dubernard.

NOTICE.

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